Comments on Draft report- E on- Kentucky Utilities- Pineville Generating Station

EPA: None

State: None

Company: See attached letter dated January 26, 2011

LG&E KU
PPL companies

Generation Services

<u>*VIA OVERNIGHT DELIVERY*</u>

Mr. Stephen Hoffman
U.S. Environmental Protection Agency
Two Potomac Yard
2733 South Crystal Drive
Fifth Floor, N-5237
Arlington, VA 22202-2733

January 26, 2011

Re: Kentucky Utilities' Comments on
DRAFT Report of Geotechnical Investigation Dam Safety Assessment of Coal Combustion Surface Impoundments Kentucky Utilities, a Subsidiary of E.ON U.S. Pineville Generating Station, Pineville, Kentucky

Dear Mr. Hoffman:

The U.S. Environmental Protection Agency (EPA) requested comments from Kentucky Utilities (KU) on a draft report regarding the coal combustion byproduct impoundment at KU's Pineville Generating Station. AMEC, an engineering contractor for EPA, prepared the draft report dated September 2010 to provide results of an assessment of the structural stability of one impoundment at Pineville Station, commonly referred to as the Pineville Ash Pond.

The scope of AMEC's assessment included a site visit to perform visual observations of the impoundment and a review of documentation provided by KU. As part of the assessment, AMEC assigned a condition rating and a hazard rating to the Pineville Ash Pond using their engineering judgment and understanding of criteria developed by the EPA.

In conducting its assessment, AMEC utilized impoundment guidelines issued by the Mine Safety and Health Administration (MSHA). However, the MSHA guidelines are aimed at coal slurry ponds at mine sites, rather than the CCR impoundments found at a power plant. The MSHA standards are not legally applicable to our impoundments and in fact differ substantially from the standards that are applicable to our facilities. As you know, over the past two years EPA has assessed impoundments at several other facilities owned by KU or its affiliates. None of the EPA contractors conducting assessments of our facilities has utilized MSHA guidelines in preparing its reports. In fact, of the dozens of assessments of power plant impoundments that EPA has conducted across the nation, we are unaware of any EPA contractor other than AMEC utilizing MSHA guidelines in preparing its reports. Consequently, we object to the use of MSHA guidelines for inspection of our facilities because they are legally inapplicable, inappropriate from a technical standpoint, and inconsistent with past EPA practice. In the present situation, where EPA is conducting nation-wide assessments to determine whether CCR impoundments pose any significant risk to the public, it is particularly inappropriate for EPA to apply differing standards depending on the EPA contractor that conducts the assessment.

We disagree with the "poor" condition rating which AMEC has assigned to each of our impoundments. Based on AMEC's site inspection in August of 2010, AMEC found "no major operational or maintenance issues that needed to be addressed." However, AMEC determined to assign a poor condition rating based on the absence of certain information specified under the MSHA guidelines. It is entirely permissible under the MSHA guidelines to consider methods and procedures and other information that falls outside the gambit of the MSHA program to verify the safety of an impoundment.

According to the preface of MSHA's *Engineering and Design Manual Coal Refuse Disposal Facilities*, Second Edition, May 2009: "*The guidance presented in this Manual represents information, methods and procedures that are recommended for consideration by designers, coal operators, and regulators. The guidance presented in this Manual is not regulation and cannot be enforced as such. It is not intended to preclude the application of other credible methods and procedures or the use of other and new information that will result in a safe and reliable coal refuse disposal facility.*"

Kentucky has established a dam safety regulatory program under KRS Chapter 151 which involves permitting and inspection of impoundments. KRS 150.295 directs the Secretary of the Energy and Environment Cabinet (EEC) to inspect dams and reservoirs on a regular schedule. KRS 151.100 defines the word dam to mean any artificial barrier, including appurtenant works, which does or can impound or divert water and which either (a) is or will be 25 feet or more in height or (b) has or will have an impounding capacity at maximum water storage elevation of 50 acre-feet or more. All such dams are subject to the provisions of KRS Chapter 151 and are regulated by the EEC, Department for Environmental Protection (KY DEP).

The Secretary of the EPC is empowered by KRS 151 to administer and enforce the law using methods and procedures such as adopting rules and regulations, routinely inspecting dams, issuing permits and certificates of inspection, requiring owners to take action to protect life and property, and conducting studies and investigations as necessary to ensure compliance. KY DEP maintains an experienced technical staff to enforce regulations and administer the methods and procedures of the Secretary.

The EPC's regulations incorporate two technical publications that provide methods and procedures for the design, construction and safe operation of dams. These publications are *The Division of Water Engineering Memorandum No. 5* and *Guidelines for Geotechnical Investigation and Analysis of New and Existing Earth Dams*. Kentucky professional engineers have historically used these publications for the design and construction of numerous projects which have been determined to be safe and reliable. These publications provide appropriately conservative methods and procedures for the design, construction and operation of safe CCR impoundments. MSHA impoundment guidelines are designed to regulate a broader array of potential dam integrity issues and materials with differing physical properties than CCRs. KU does not consider the strict application of MSHA impoundment guidelines to be necessary or appropriate for CCR impoundments. Nor does KU interpret the MSHA guidelines as precluding reliance on relevant information available under the Kentucky Dam Safety program or otherwise available to EPA.

According to Kentucky regulations, the Pineville Ash Pond is not large enough to be classified as a dam and does not present a hazard to life or property. Out of an abundance of caution and to assist KY DEP, EPA and AMEC, KU has conducted a suite of additional studies and investigations to confirm the safety of the Pineville Ash Pond. The studies and investigations included a comprehensive geotechnical exploration, an instrumentation program, a geological laboratory testing program, a slope stability analysis, a hydrologic and hydraulic analysis, and a recent engineering condition assessment by an independent registered professional engineer. These further studies concluded that the Pineville Ash Pond is in acceptable condition.

KU has included these additional studies, clerical and technical corrections to AMEC's draft report as the following attachments to this letter.

Attachment 1 – KU's Comments - clerical and technical corrections to *DRAFT Report of Geotechnical Investigation Dam Safety Assessment of Coal Combustion Surface Impoundments Kentucky Utilities, a Subsidiary of E.ON U.S. Pineville Generating Station, Pineville, Kentucky*

Attachment 2 - *Report of Geotechnical Exploration and Slope Stability Analyses Kentucky Utilities (KU) Pineville Power Station Ash Pond Fourmile, Bell County, Kentucky,* September 8, 2010, Mactec Engineering and Consulting, Inc.

Addendum A, Report of Geotechnical Exploration and Slope Stability Analyses KU Pineville Power Station – Ash Pond, Fourmile, Bell County, Kentucky, January 19, 2011, Mactec Engineering and Consulting, Inc.

Attachment 3 – *KU Pineville Ash Pond: Hydrologic and Hydraulic Assessment,* January 17, 2011, LG&E and KU Services Company

Attachment 4 – Cover pages, cover letter, appendices A and C of *2011 Pond Inspections Visual Site Assessment Report Six Impoundment Facilities*, January 25, 2011, ATC Associates, Inc.

KU respectfully requests that EPA direct AMEC, in finalizing the report, to refrain from applying MSHA guidelines and to consider all information available under the Kentucky Dam Safety Program as well as the additional studies and investigations performed by KU. KU believes that the additional information clearly shows the CCR impoundments at Green River Station are in acceptable condition.

Also, please note that on November 1, 2010, the name of E.ON U.S. LLC was changed to LG&E and KU Energy LLC. Consequently, any references to E.ON U.S. should be changed to LG&E and KU Energy.

We appreciate the opportunity to comment. If you have any questions regarding these comments, please contact me using the information provided below.

Thank you,

David J. Millay

David Millay, PE
Civil Engineer, LG&E and KU Services Company
Phone 502-627-2468
david.millay@lge-ku.com

Attachments

Cc: James Kohler, PE, U.S. Environmental Protection Agency
Gary Wells, PE, Kentucky Department of Environmental Protection (KY DEP) – Dam Safety Section
Michael Winkler, LG&E and KU Services Company
John Voyles, LG&E and KU Services Company

<u>Attachment 1</u>

KU Comments-clerical and technical corrections to
DRAFT Report of Geotechnical Investigation Dam Safety Assessment of Coal Combustion Surface Impoundments
Kentucky Utilities, a Subsidiary of E.ON U.S.
Pineville Generating Station, Pineville, Kentucky

AMEC Project No. 3-2106-0177.0003

Prepared by AMEC Earth & Environmental, Inc.,
September 2010

KU General comments:

In Kentucky, CCR impoundments are regulated by the Energy and Environmental Cabinet, Department of Environmental Protection, Division of Water. The U.S. Department of Labor, Mine Safety Health Administration (MSHA) does not regulate CCR impoundments in Kentucky. MSHA impoundment guidelines are designed to regulate a broader array of potential dam integrity issues and materials with differing physical properties than CCRs. KU does not consider the strict application of MSHA impoundment guidelines to be necessary or appropriate for CCR impoundments in Kentucky.

Inside of cover page

"Kentucky Utilities a wholly owned subsidiary of E.ON U.S., Pineville Generating Station…"

Page 1, *1.1 Introduction*
First paragraph, fourth line:
"…perform a site assessment of Kentucky Utilities (a wholly owned ~~S~~subsidiary of E.ON U.S.) Pineville Generating…"

Page 1, Table 1. *Site Visit Attendees*

~~*E.ON U.S.*~~ Kentucky Utilities Barry Currens, Manager Tyrone Operations
~~*E.ON U.S.*~~ Kentucky Utilities Michael P. Luster, Contract Administrator
E.ON U.S., Environmental Affairs Roger J. Medina, Senior Chemical Engineer
E.ON U.S., Generation Engineering David Millay, P.E., Civil Engineer
Kentucky Utilities Michael Ross, Pineville Maintenance Contractor

Page 1, section *1.2 Project Background*
First paragraph, third, fourth, and fifth lines
"The last operational unit, Unit 3 at t~~T~~he Pineville Generating Station was retired in 2001~~*and is permanently out of service*~~. The station no longer generates power, but the boiler-turbine building is still used as an electrical control facility. Although all of the generating units are ~~*plant is*~~ retired, an ash pond on site contains previously generated CCW."

Page 2, section *1.2 Project Background*
First, second and third paragraphs

"Based on a site visit evaluation of the impoundment~~s~~, AMEC engineers assigned a "Significant Hazard Potential" classification to the Pineville Ash Pond"

KU Notes:

Refer to KRS 151.250

" 151.250 Plans for dams, levees, etc. to be approved and permit issued by cabinet -- Jurisdiction of Department for Natural Resources.
(1) Notwithstanding any other provision of law, no person and no city, county, or other political subdivision of the state, including levee districts, drainage districts, flood control districts or systems, or similar bodies, shall commence the construction, reconstruction, relocation or improvement of any dam, embankment, levee, dike, bridge, fill or other obstruction (except those constructed by the Department of Highways) across or along any stream, or in the floodway of any stream, unless the plans and specifications for such work have been submitted by the person or political subdivision responsible for the construction, reconstruction or improvement and such plans and specifications have been approved in writing by the cabinet and a permit issued. However, the cabinet by regulation may exempt those dams, embankments or other obstructions which are not of such size or type as to require approval by the cabinet in the interest of safety or retention of water supply."

The Pineville Ash Pond is exempt from Kentucky dam safety regulations as it is not of such size to require approval by the cabinet in the interest of safety.

Page 3, section *1.4.1 Ash Handling and Flow Summary*
First paragraph

KU Notes: To clarify, the Process Flows Narrative provided by KU did not state, "Pineville Generating Station is permanently out of service". The narrative does state that plant operations were discontinued in 2001.

For ready reference, a copy of the Process Flows Narrative is included below:

"Pineville Generating Station (Retired) - Ash Treatment Basin (also known as Pineville Ash Pond)
Process Flows Narrative – August 2010

The Pineville plant ash treatment basin is less than 7 acres of surface area. The basin receives one process water flow from the retired Pineville plant and rainfall runoff flows from several areas. The basin discharges from a rectangular reinforced concrete decant structure with reinforced concrete stoplogs to control pond-level. A floating skimmer is installed upstream of the decant structure to prevent the potential discharge of floating solids or oil sheens. The flow is conveyed to a Kentucky Pollution Discharge Elimination System (KPDES) monitoring and sampling point. This monitoring/sampling point consists of a concrete structure with a stainless steel v-notched-weir. Flow from the monitoring/sampling point structure discharges to a rip-rap lined channel which directs flow to the Cumberland River downstream of the plant buildings.

The sole process flow to the ash basin comes from the plant boiler-turbine building basement sump pumps, which receive only groundwater infiltration since plant operations were discontinued in 2001. These flows are pumped to an oil-water separator adjacent the plant building and the cleaned effluent flows to a final sump which is pumped to the ash basin. The rainfall runoff areas which are pumped to the ash basin include the 2 substations immediately northeast of the plant boiler-turbine building as well as the roof drains. These runoff flows drain to the same sump adjacent the building which receives the oil-water separator cleaned discharge; the combined flows are pumped to the ash basin. The ash pond also receives rainfall runoff flows associated with the watershed basin of the pond itself and also runoff from portions of a substation located uphill. The substation is graded to drain through oil-containment barriers prior to flowing into the basin."

Page 3, section *1.4.1 Ash Handling and Flow Summary*
First paragraph

KU Note: The Pineville Ash Pond was designed by a professional engineer, J.M. McLaughlin, Kentucky Professional Engineer number 9039. Reference Sargent & Lundy project drawings transmitted by KU to AMEC on July 30, 2010.

Page 5, section *2.2 Pineville Ash Pond – Visual Observations*
First paragraph, first sentence

"The Pineville Ash Pond contains fly ash, bottom ash, ~~*boiler slag*~~ and other low volume wastes."

KU Note: The definition of Boiler Slag from the American Association of Coal Ash is as follows: a molten ash collected at the base of slag tap and cyclone furnaces that is quenched with water and shatters into black, angular particles having a smooth, glassy appearance."

Pineville Generating Station did not operate slag tap or cyclone furnaces.

Page 6, section 2.3 Monitoring Instrumentation
First paragraph, first sentence

KU Note: The Pineville Ash Pond was designed and constructed with a weirbox structure and metal plate v-notch weir at the ash pond flow measurement structure. Weirs are instruments used to measure and monitor flow.

Page 10, section 3.2.1 Pineville Ash Pond
Second paragraph

"Based on its size, the Pineville Ash Pond qualifies for the first, smaller category as defined by MSHA in Table 2"

KU Note: The Pineville Ash Pond does not qualify for any MSHA category because MSHA does not have jurisdictional authority to regulate the Pineville Ash Pond.

The Pineville Ash Pond is exempt from Kentucky regulations because it is small and does not create a hazard to life or property.

Page 11, section *3.3 Structural Adequacy and Stability*
First, second, and third paragraphs

KU Notes: There are four typographical errors where "Table 2" should be changed to "Table 3".

Table 3 heading "Minimum ~~Required~~ Dam Safety Factors"

KU suggests that AMEC should delete the word "required" as it does not apply to all three agencies published documents regarding minimum safety factors.

Page 15, section *3.5.1 Instrumentation*
Table 6

KU Notes: The Pineville Ash Pond was designed and constructed with a weirbox structure and a metal plate v-notch weir at the ash pond flow measurement structure. Weirs are instruments used to measure and monitor flow.

See attachment 2 for additional piezometer readings.

Pages 17 section *4.1 Acknowledgement of Management Unit Conditions*

KU Notes: KU has provided additional information that shows all the Pineville Ash Pond is not in poor condition. For the draft and final reports, KU suggests that AMEC adjust the assigned condition rating to reflect the acceptable conditions.

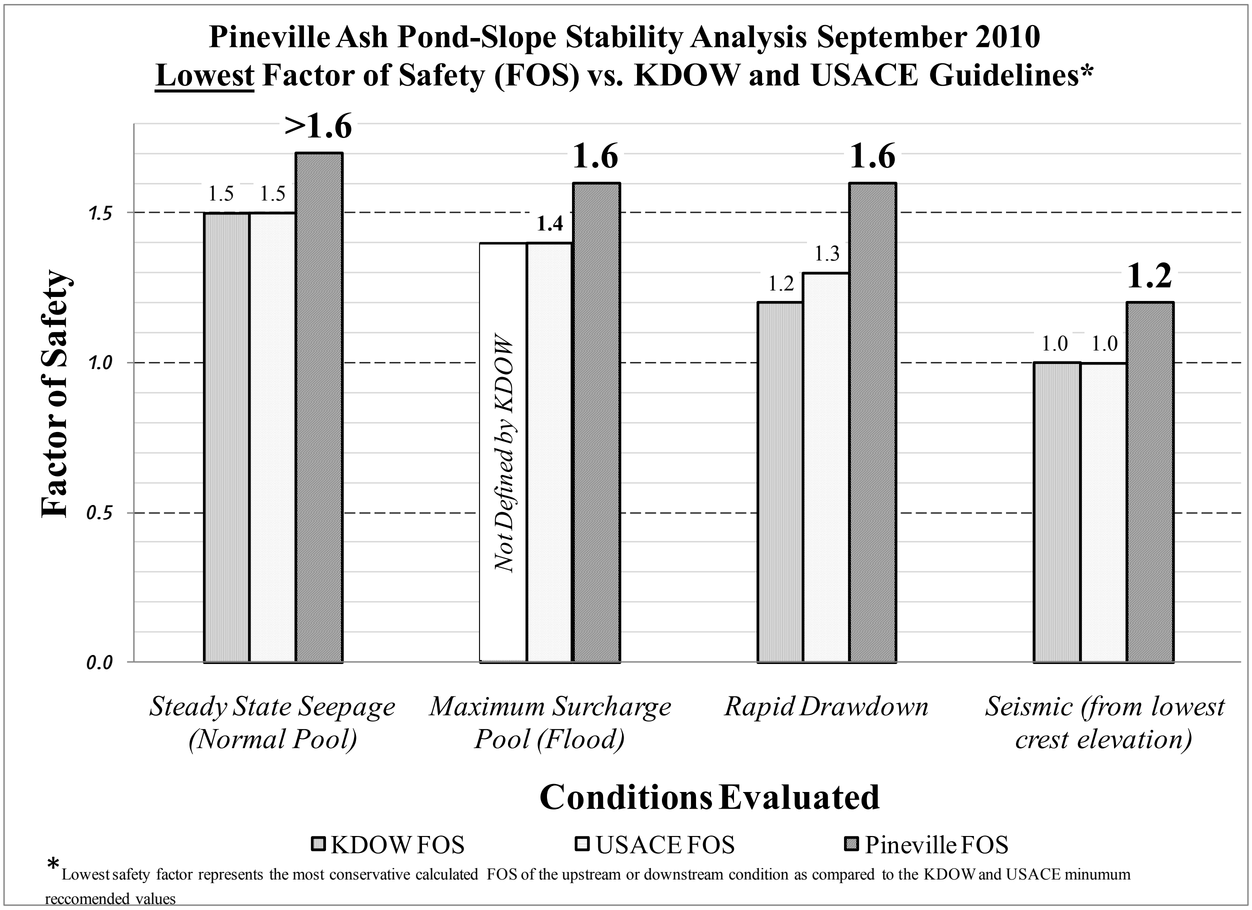
Page 17, section *4.1.1 Hydrologic and Hydraulic Recommendations*

KU Notes: A hydrologic and hydraulic study for the Pineville Ash Pond was completed in January, 2011 and is included as attachment 3. Although the Pineville Ash Pond is exempt from Kentucky dam safety regulations, the study concluded that the Pineville Ash Pond meets Kentucky regulations for a Class A, Low Hazard dam.

Page 18, section *4.1.2 Geotechnical and Stability Recommendations*

KU Notes: A comprehensive geotechnical exploration and slope stability analysis for the Pineville Ash Pond was completed in September, 2010 and is included as attachment 2. The results of the analysis are summarized in Table 1.

Table 1



Page 18, section *4.1.3 Monitoring and Instrumentation Recommendations*

KU Notes: KU continues to periodically monitor instrumentation including piezometers and the principal spillway weir at the Pineville Ash Pond.

Page 19, section *4.1.4 Inspection Recommendations*

"AMEC has reviewed provided information consisting of one inspection record by ATC dated ~~*January 10, 2010*~~ October 23, 2009 for the Pineville Ash Pond."

KU Notes: ATC Associates conducted an independent third party inspection of the Pineville Ash Pond in January, 2011. ATC do not recognize any dam safety deficiencies and noted only routine minor maintenance items. KU is developing plans to address the priority maintenance items in 2011.

<u>Attachment 2</u>

Report of Geotechnical Exploration and Slope Stability Analyses
Kentucky Utilities (KU) Pineville Power Station Ash Pond
Fourmile, Bell County, Kentucky

September 8, 2010,
Mactec Engineering and Consulting, Inc.

Addendum A, Report of Geotechnical Exploration and Slope Stability Analyses
KU Pineville Power Station – Ash Pond
Fourmile, Bell County, Kentucky,

January 19, 2011
Mactec Engineering and Consulting, Inc.

REPORT OF GEOTECHNICAL EXPLORATION AND SLOPE STABILITY ANALYSES

KENTUCKY UTILITIES (KU)
PINEVILLE POWER STATION ASH POND
FOURMILE, BELL COUNTY, KENTUCKY

Prepared For:

E. ON U.S. Services, Inc.
220 West Main Street
Louisville, Kentucky 40202

E.ON U.S. Contract Number 31528

Prepared By:

MACTEC ENGINEERING AND CONSULTING, INC.
13425 Eastpoint Centre Drive, Suite 122
Louisville, Kentucky 40222

MACTEC PROJECT 3143-10-1317.03

September 8, 2010

MACTEC

engineering and constructing a better tomorrow

September 8, 2010

Mr. David J. Millay, P.E.
E.ON U.S. Services, Inc.
220 West Main Street
Louisville, Kentucky 40202
Phone: 502-627-2468
Facsimile: 502-217-2850
Electronic mail: David.Millay@eon-us.com

SUBJECT: Report of Geotechnical Exploration and Slope Stability Analyses
KU Pineville Power Station – Ash Pond
Fourmile, Bell County, Kentucky
MACTEC Project Number 3143-10-1317.01

Dear Mr. Millay:

MACTEC Engineering and Consulting, Inc. (MACTEC) is pleased to submit this Report of Geotechnical Exploration and Slope Stability Analyses for the Ash Pond at the KU Pineville Power Station in Fourmile, Bell County, Kentucky. Our services were provided in general accordance with our Master Agreement Number 31528, Contract Number 495429 dated August 23, 2010 and our Proposal Number PROP10LVLE Task 162.

The attached report presents a review of the project information provided to us, a description of the site and subsurface conditions encountered, and a summary of our slope stability analyses and findings and conclusions for the existing Ash Pond at the KU Pineville Power Station. The Appendix to the report contains site and boring location plans, the results of our field and laboratory testing, as well as the results of our slope stability analyses.

MACTEC appreciates this opportunity to provide our services to you and we look forward to serving as your geotechnical consultant throughout this project. Please contact us if you have any questions regarding the information presented.

Sincerely,

MACTEC ENGINEERING AND CONSULTING, INC.

STATE OF KENTUCKY
APRIL LASHLEY BRENNEMAN
26750
LICENSED PROFESSIONAL ENGINEER

April L. Brenneman, P.E.
Project Engineer
Licensed Kentucky 26750

Nicholas G. Schmitt, P.E.
Senior Principal Engineer
Licensed Kentucky 10311

Attachment: Report of Geotechnical Exploration

1. EXECUTIVE SUMMARY

Kentucky Utilities (KU) retained MACTEC Engineering and Consulting, Inc. (MACTEC) to provide geotechnical engineering consulting services and to conduct geotechnical explorations and slope stability analyses on the Ash Pond at the KU Pineville Power Station in Fourmile, Bell County, Kentucky. MACTEC's engineering approach was based on 1) a systematic process of obtaining and reviewing available data; 2) developing an exploration approach to efficiently obtain additional data that is required to evaluate the stability of the structure and 3) assigning a project team with all the requisite technical skills and experience necessary to fully evaluate the existing impoundment conditions, competency and stability.

MACTEC assembled a geotechnical engineering team that met with KU representatives to outline our engineering approach and geotechnical exploration. We reviewed various materials provided by KU, including aerial photographs, topographic mapping and design drawings. MACTEC developed a geotechnical exploratory drilling program, piezometer installation program and a geotechnical laboratory testing program. This data was collaboratively used to model the slope stability of the three selected cross-sections and deduce from those models the "critical" cross-sections based on the target Factors of Safety recommended in the regulatory guidelines for this type of impoundment.

The geotechnical exploration program was developed to obtain subsurface data along the 800 linear feet of dam at areas we judged to be "critical" based on the topography and nature of the exposed slope. A total of 150 feet of exploratory drilling in six soil test borings were advanced on both the crest and toe of the dam. Two piezometers were installed in the crest borings to monitor the pieziometric water level(s) within the embankment. The geotechnical laboratory testing program consisted of extensive classification and strength tests. Generally, the dike was constructed of silty to sandy clay fill reportedly excavated from a nearby borrow area (as shown on the design drawings provided by KU). The clay fill was placed overlying existing alluvial soils comprised predominately of clay with some sandy soils.

Based on our geotechnical exploration, results of laboratory testing and slope stability analyses, we have concluded that the Ash Pond at the Pineville Power Station is structurally stable from a geotechnical standpoint.

2. PURPOSE AND SCOPE OF EXPLORATION

The purpose of this exploration was to obtain site specific subsurface information for the development of slope models to analyze the stability of the existing Ash Pond at the KU Pineville Power Station. The primary guidance documents for the development of our exploration and analyses included: Kentucky Environment and Energy Cabinet, Water Infrastructure Branch, Dam Safety Division Guidelines (primarily Engineering Memorandum Number 5 and KAR 401:030 – Design Criteria for Dams and Associated Structures and "Guidelines for Geotechnical Investigation and Analysis of New and Existing Earth Dams") and the U.S. Army Corps of Engineers Engineering Manual (USACE) EM 1110-2-1902. In addition, the "Engineering and Design Manual" (dated May 2009) by Mine Safety and Health Administration (MSHA) was referenced for seismic stability analyses. These guidance documents suggest a Factor of Safety (FOS) of 1.5 for long-term, steady-state conditions using maximum storage pool (EM 1110-2-1902 suggests a FOS of 1.4 for long-term, steady-state conditions using maximum surcharge pool); a FOS of 1.2 for rapid drawdown (EM 1110-2-1902 suggests a FOS in the range of 1.1-1.3); and a FOS of 1.0 for seismic conditions (MSHA suggests a FOS of 1.2 for seismic conditions).

Our scope of services included a review of aerial photographs and construction drawings provided by KU, a review of available geologic and topographic mapping, performing site reconnaissance and field exploratory drilling, laboratory testing, performing slope stability analyses and providing recommendations specific to the Ash Pond. A total of six soil test borings were drilled to obtain subsurface data at three cross-sections along the dam at areas we judged to be "critical" based on the topography and nature of the exposed slope. The cross-sections are spaced on approximate 200 to 250 foot intervals along the existing embankment to obtain subsurface geotechnical data along the crest and toe of the dike. Two piezometers were installed in the embankment crest to monitor piezometric levels within the dam. Water levels in the piezometers were recorded after installation on August 13, 2010 and again on August 25, 2010.

The scope of our services included an investigation of the geotechnical stability of the embankments and did not include an environmental assessment.

3. PROJECT INFORMATION

Project information for this exploration was provided by Mr. David J. Millay, P.E. during multiple telephone conversations and electronic mail transmittals and a site visit held on August 13, 2010 in conjunction with the field exploration.

KU retained MACTEC to provide geotechnical engineering consulting services on the Pineville Power Station Ash Pond. This report presents a summary of our geotechnical exploration, slope stability analyses, findings and conclusions pertinent to the Ash Pond. Herein, the term "site" shall refer specifically to the Ash Pond at the KU Pineville Power Station.

The Ash Pond at the Pineville Power Station has a design surface area of approximately 6.5 acres and was constructed in the late 1970s to manage fly ash collected from electrostatic precipitators. The impoundment is partially diked, with a side-hill configuration consisting of two constructed embankments at the west and south pond limits, totaling approximately 800 linear feet of embankments. The reported crest elevation is 1,015 National Geodetic Vertical Datum of 1929 (NGVD) with a typical design crest width of approximately 12 feet. The bottom of pond elevation is 1,000 feet NGVD. The downstream toe elevation varies with the lowest toe elevation of 1000.2 feet NGVD resulting in a maximum dam height of approximately 15 feet. The normal operating pool elevation is approximately elevation 1,010 feet NGVD. The maximum theoretical pool elevation is approximately 1,015 feet NGVD (principal spillway riser elevation). The downstream design slope faces are nominally reported to be 2.5H:1V (horizontal to vertical) and the upstream slopes (wet side) are nominally 2.5H:1V.

3.1 FILE REVIEW

KU representatives provided MACTEC with the following documents and drawings specific to this project. MACTEC assembled a geotechnical engineering team who outlined an engineering approach and geotechnical exploration based on a review of the provided data.

- *Site Plan, Coal Pile Area, Pineville Power Station, Drawing No: C-1,* dated December 1, 1976, revised July 25, 1988, prepared by Sargent & Lundy Engineers

- *Ash Pond Flow Measurement Structure – Plan & Sections, Pineville Power Station, Drawing No: C-5,* dated December 1, 1976, revised July 25, 1988, prepared by Sargent & Lundy Engineers

- *Ash Pond Area – Section & Details, Pineville Power Station, Drawing No: C-7,* dated December 1, 1976, revised July 25, 1988, prepared by Sargent & Lundy Engineers

- *Ash Pond Weir Box Structures – Water Pollution Control Facilities, Pineville Power Station, Drawing No: S-11,* dated December 1, 1976, revised July 25, 1988, prepared by Sargent & Lundy Engineers

- *E.ON Pineville Mapping, dated January 28, 2010, prepared by L. Robert Kimball & Associates, LLC.*

- Several Aerial Images of Pineville Power Station , untitled and undated, provided by KU

3.2 SITE VISIT

Mr. David J. Millay, P.E. met with Mr. Nick Jones, E.I.T. of MACTEC on site on August 13, 2010 to perform a site reconnaissance and field exploration. A drilling plan which included the advancement of a set of exploratory borings (one boring advanced on the crest and one boring advanced on the downstream toe of the dike) spaced on approximate 200 to 250 foot intervals was proposed by KU. Given that the length of the diked portion of the Ash Pond is approximately 800 feet, this spacing interval provided adequate coverage for the subsurface exploration. Further, cross-sections were selected at areas judged to be “critical” based on the topography and the nature of the exposed slope.

Based on our file review, discussions with KU and our site visit, MACTEC developed a geotechnical exploratory drilling program, a pieziometric monitoring program, a geotechnical laboratory testing program to assess the stability of the Ash Pond. This data was collaboratively used to model the slope stability of the three selected cross-sections and deduce from those models the “critical” cross-sections based on the target Factors of Safety recommended in the regulatory guidelines for this type of impoundment.

4. EXPLORATORY FINDINGS

4.1 SURFACE CONDITIONS

MACTEC conducted a site reconnaissance on August 13, 2010 during our drilling operations. The site surface conditions were observed and documented and the information gathered was used to interpret the subsurface data, and to detect conditions which could affect our recommendations.

The existing Ash Pond is located on the west side of the existing KU Pineville Power Station in Fourmile, Bell County, Kentucky. The Pond is approximately 700 feet east of the Cumberland River and is located about 0.25 miles west of U.S. Route 25 / Riverview Road. The pond was constructed in the late 1970s to manage fly ash collected from electrostatic precipitators. The last of three generating units (Unit 3) at the Pineville Power Station was retired in 2001; therefore the Ash Pond is not receiving Coal Combustion Waste (CCW).

Surface cover consisted primarily of mowed grass along the crest and toe and the interior and exterior slopes of the embankment. Isolated areas with sparse vegetation were found within the pond.

4.2 SITE GEOLOGY

A review of the *Geologic Map of the Pineville Quadrangle, Bell County, Kentucky*, published by the United States Geological Survey (USGS), dated 1964, indicates the site is underlain by Alluvium deposits of Pleistocene and Holocene series of the Quaternary age and artificial fill. Based on the USGS mapping, the underlying units are described as follows.

The Alluvium deposits are located throughout the site and are composed of flood plain and low-level terrace deposits. The boundary between the two types of deposits is generally poorly defined and gradational.

The alluvium consists of; silt, clay, sand and gravel. The silt and clay are described as light gray to dark brown, laminated to thin bedded and rich in organic matter. The sand is described as light gray to brown, fine to medium, well sorted with graded bedding and is composed of grains of quartz with minor amounts of mica and detrital coal and rock fragments. Silt, clay and sand deposits are generally thickest along the river banks. The gravel consists of well rounded pebbles, cobbles and boulders of siltstone and coal from the Breathitt formation. Along the Cumberland River, gravel also consists of clasts of limestone, quartz, chert and conglomeratic and quartzose sandstone derived from rocks of Mississippian and Pennsylvanian age in the Cumberland overthrust block to the southeast. The thickness of alluvium may be as much as 50 feet.

Alluvium of low-level terrace deposits is made up of sand, silt, gravel and clay. The sand, silt and clay are described as light yellowish brown to brown and red, thin bedded to massive. The sand is fine-grained, contains quartzose and scattered pebbles, cobbles and boulders. Gravel consists of well rounded pebbles, cobbles and boulders of quartz, weathered chert and conglomeratic quartzose sandstone as well as siltstone and coal from Breathitt formation. Gravel forms lenses as much as 5 feet thick in finer alluvium. The thickness of alluvium may be as much as 50 feet.

The artificial fill is shown within the power station and is assumed to be associated with earthwork activities from plant construction and operation.

4.3 SOIL SURVEY

According to: the United States Department of Agriculture (USDA) Soil Survey of Bell and Harlan Counties, Kentucky (Natural Resource Conservation Service (NRCS) website), dated October, 2009, the soils beneath the subject site consist primarily of Urdothents-Urban land complex (UrC) on 3 to 15 percent slopes within the Ash Pond and embankment areas.

The Udorthents-Urban land Complex consists of "Udorthents, unstable fill, Urban land" and other minor components. Udorthents, unstable fill consists of a deep to very deep mixture of geologic and artificial materials that have been graded and smoothed in order to build urban structures. This complex is generally 3 to 15 percent sloping in the site area. This complex is found on reclaimed lands on mountain slopes on mountains. The parent material consists of loamy skeletal mine spoil or earthy fill derived from interbedded sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. There is no zone of water saturation within a depth of 72 inches. Non-irrigated land capability classification is 6s. This soil does not meet hydric criteria.

Urban land generally consists of areas where the land surface is covered by commercial and industrial buildings, houses, railroad yards, streets, parking lots, and other impervious surfaces. This Urban land complex is generally 3 to 15 percent sloping in the mapped areas.

The following map shows the distribution of the two primary soil series found in the project area (NRCS website).

Figure 1. USDA Soil Survey Map of Project Site
Source: Web Soil Survey – NRCS Website
Soil Survey Area: Bell and Harlan Counties, Kentucky
Survey Area Data: Version 9, Oct 23, 2009
Date aerial image was photographed: Sep 21, 2004

4.4 SUBSURFACE CONDITIONS

A comprehensive field exploration program was developed to evaluate the existing impoundment's conditions, competency and stability according to the scope of services developed by MACTEC and KU, the guidance documents previously referenced and MACTEC's experience in the region. Exploratory drilling and piezometer installations were performed in August 13, 2010. Drilling was performed by Hoosier Drilling Contractors, LLC using a CME-55 drill rig equipped with an automatic hammer. A MACTEC representative was on-site during the field work to direct drilling operations, collect and classify samples. Drilling operations were performed in general accordance with ASTM procedures for subsurface explorations as presented in Appendix.

The subsurface conditions were explored with six soil test borings. Borings labeled with the suffix "C" represent borings drilled in the crest of the dike. Borings labeled with the suffix "T" represent borings drilled in the toe of the embankment. Three borings were drilled along the crest of the dike (herein referred to as B-1C through B-3C). Three borings were drilled along the toe of the dike (herein referred to as B-1T through B-3T). All borings (except borings in which piezometers were installed) were backfilled with cement-bentonite grout.

The planned boring locations were determined in the field by MACTEC using a hand-held GPS unit for a total of three embankment cross-sections. The elevations of the borings were interpolated from topographic mapping provided by KU. The boring locations and elevations discussed in this report and shown in the Appendix should be considered accurate to the degree implied by the method used. The boring locations, depths and elevations are summarized in Table 1.

Table 1. Boring Location Summary

Boring ID	Latitude	Longitude	Top of Ground Elevation (ft) (NGVD)	Boring Termination Depth (ft)	Bottom of Boring Elevation (ft) (NGVD)
B-1C	36.79546	-83.75891	1013.7	35.5	978.2
B-1T	36.79550	-83.75914	1000.6	15.5	985.1
B-2C	36.79490	-83.75898	1014.2	35.0	979.2
B-2T	36.79490	-83.75919	1000.2	15.5	984.7
B-3C	36.79450	-83.75834	1014.6	35.5	979.1
B-3T	36.79434	-83.75846	1001.7	15.5	986.2

Prepared By: VM

Checked By: ALB

The subsurface conditions encountered at the test boring locations are shown on the Test Boring Records in the Appendix. These Test Boring Records represent our interpretation of the subsurface conditions based on the field logs, visual examination of field samples by an engineer, and tests of the field samples. The interface between various strata on the Test Boring Records represents the approximate interface location. In addition, the transition between strata may be gradual. Water levels shown on the Test Boring Records represent the conditions only at the time of our exploration.

The general subsurface conditions are summarized in the following sections:

Surface Layer - Fill – All of our borings encountered a surface fill layer, 0.2 to 0.5 feet thick, consisting of grass and topsoil.

Beneath the **Surface Layer,** our borings generally encountered three soil strata (designated as Stratum I through Stratum III) consisting of fill material including clay fill (Stratum I) and alluvial soils including lean clay with varying amounts of sand (Stratum II) and silty to gravelly sand (Stratum III).

Stratum I – Lean Clay (Fill) – Fill material consisting of lean clay was encountered in the crest and toe borings, underlying the surface layer. This material is assumed to be structural fill placed during the construction of the pond embankment. The fill extended to depths ranging from approximately 12 to 15 feet in the crest borings and to about 2 feet in the toe borings.

This material generally consisted of orange brown, light brown and light gray, silty and sandy, lean clay. Trace amounts of organics were occasionally encountered. The soils were visually classified as "CL" type soils, clayey soils of low plasticity, according to the United Soil Classification System (USCS). The standard penetration test values (N-values) ranged from 5 to 12 blows per foot (bpf) with an average on the order of 10 bpf. Based on the consistency of the recovered soil samples and the recorded penetration resistance values, the consistency of the structural fill soils were judged to typically range from firm to stiff.

Laboratory tests were performed on selected samples of the Stratum I fill soils. Soil plasticity tests (Atterberg limits) performed on selected undisturbed samples from Borings B-1C through B-3C indicated Liquid Limits in the range of 35 to 47 and Plasticity Indices in the range of 12 to 19. Grain size analyses indicated the percentage of material passing the #200 sieve on the above samples ranged in percent fines (clay and silt) from 79 to 82 percent in the material. These values correspond to "CL" type soils, according to the USCS. The natural moisture contents of the samples tested ranged from 13.6 to 23.9 percent, with an average on the order of 18.8 percent.

A consolidated undrained triaxial shear test with pore pressure monitoring was performed on an undisturbed (Shelby tube) sample collected from Boring B-1C (from a depth of 12 to 14 feet). The total stress indicated a cohesion of approximately 1,300 pounds per square foot (psf) and a internal angle of friction (phi) of 23 degrees and effective stress parameters indicating a cohesion of approximately 20 psf and phi 33 degrees.

S**tratum II – Lean Clay (Alluvium) –** Alluvium consisting of silty to sandy, lean clay was encountered underlying the Stratum I fill materials in the three crest borings and in the three toe borings. This material extended to depths ranging from about 26 feet in Boring B-1C and the boring termination depth of 35 feet in Borings B-2C and B-3C and to approximately 12 in Boring B-2T and the boring termination depth of 15 feet in Borings B-1T and B-3T. This material consisted of orange brown, gray and tan, silty and sandy, lean clay with some gravel. The soils were visually classified as “CL” and “CL-ML” type soils, clayey soils of low plasticity, according to the USCS. The SPT N-values ranged from 5 to 40 bpf with an average on the order of 10 bpf. The consistency of this material was judged to typically range from firm to stiff.

Laboratory tests were performed on selected samples of the Stratum II soils. Soil plasticity tests performed on selected samples from Borings B-1T, B-2C, B-3C and B-3T indicated Liquid Limit values ranging from 24 to 43 and Plasticity Indices ranging from 7 to 19. Grain size analyses indicated the percentage of material passing the #200 sieve to consist of 82 percent fines (silt and clay) in the material. These values correspond to "CL" and “CL-ML” type soils, according to the USCS. The natural moisture contents of the samples tested ranged from 20.1 to 32.1 percent, with an average on the order of 18.8 percent.

Stratum III – Silty to Gravelly Sand (Alluvium) – Alluvium consisting of silty sand was encountered underlying Stratum II in Borings B-1C, B-2C and B-2T. The silty sand material extended to depths ranging from approximately 27 to 32 feet in the crest borings and to the boring termination depth of 15 feet in the toe boring. The material consisted of brown and orange brown, silty sand. The silty sand transitioned into gravelly sand in B-1C in the last 3 feet of the boring, prior to termination. The soils were visually classified as predominantly “SM” type soils, silty sands, according to the USCS. The material in the last 3 feet of B-1C was visually classified as gravelly sand “SW” according to the USCS. The SPT N-values of the silty sand ranged from 5 to 7 bpf, with an average of 6 bpf. The consistency of this material was judged to be loose. The SPT N-value of the gravelly sand sample obtained was 37 bpf. The consistency of this material was judged to be dense.

Laboratory tests were performed on selected samples of the Stratum III soils. Grain size analyses indicated the percentage of material passing the #200 sieve on samples obtained from B-1C ranged in percent fines (clay and silt) from 29 to 31 percent in the material. These values correspond to "SM" type soils, according to the USCS. The natural moisture contents of the samples tested ranged from 20.4 to 22.2 percent, with an average of 21 percent.

4.5 GROUND AND SURFACE WATER CONDITIONS

Ground water levels were measured in each of the borings upon completion of drilling. Borings B-1C and B-2C encountered water at the time of drilling at depths of approximately 25 and 27 feet. Borings B-2T and B-3T encountered water at the time of drilling at depths of 10 and 12.2 feet. Ground water conditions at the time of drilling are noted on the Test Boring Records in the Appendix. Some borings caved-in after completion of drilling to depths where true water levels could not be taken. Cave-in depths are noted on Test Boring Records, where observed.

4.5.1 PIEZOMETER INSTALLATION AND MONITORING

Piezometers were installed in the embankment crest in Borings B-1C and B-3C to monitor pieziometric levels within the dikes. The depths of the screened intervals were from 25 to 35 feet in Boring B-1C and from 15 to 25 feet in Boring B-3C, as shown on the Test Boring Records. These depths were chosen for our monitoring program to gain an understanding the pieziometric levels within embankment of the dike. It is anticipated that ground water within these zones would have the greatest impact on the stability of the dike. The results of piezometer readings taken on August 25, 2010 are summarized in Table 2 and are also shown on the Test Boring Records in the Appendix.

In addition, seeps were not observed during our site reconnaissance or during our exploratory drilling. Our borings, piezometer monitoring and the lack of signs of seepage indicate that water infiltration into the existing dike is minimal. The water levels noted in the piezometers indicate that ground water is present in the foundation soils.

Table 2. Summary of Piezometer Readings

Peizometer ID	Date of Installation	Screened Interval Depth (ft)	Top of Ground Elevation (ft) NGVD	Bottom of Piezometer Elevation (ft) NGVD	Date of Reading 8/25/10 Depth (ft)	Date of Reading 8/25/10 Elevation (ft)
B-1C	8/13/10	25-35	1013.7	978.7	13.5	1000.2
B-3C	8/13/10	15-25	1014.6	989.6	16.4	998.2

Prepared By: VM

Checked By: ALB

4.5.2 POND CONDITIONS

According to the construction drawings provided by KU, the Ash Pond was designed to have a maximum operating pool elevation of 1,015 feet NGVD (principal spillway riser elevation). The normal pool elevation for the Ash Pond is 1,009.7 feet NGVD as reported by KU. Topographic mapping (dated January 2010) shows a water surface elevation of 1,009.9 feet NGVD. Approximately one quarter of the pond has free water (south portion) and ash is at elevation 1009.9 feet NGVD in the remaining portion of the pond. Hydrographic survey data for this pond was not provided.

4.6 LABORATORY TESTING

Samples obtained during drilling operations were examined in the field and visually classified by an engineer. The soils were classified according to consistency or relative density (based on SPT N-values), color, and texture. These classification descriptions are included on our Test Boring Records in the Appendix. The classification method discussed above is primarily qualitative; for detailed soil classification two laboratory tests are necessary: plasticity characteristics and grain size distribution. Using these test results, the soil can be classified according to the USCS (ASTM D2487).

Laboratory testing was performed on selected samples obtained from our borings. These tests consisted of natural moisture content, Atterberg Limits (plasticity), grain size analyses, specific gravity and unit weight determinations. The field classifications, provided on the Test Boring Records, were adjusted to reflect the results of our laboratory testing. In addition, more sophisticated laboratory testing was performed to determine the strength of the existing dike materials. Specifically, we performed the following tests:

- 34 Natural Moisture Content Determinations
- 7 Atterberg Limits Tests
- 6 Grain Size Distribution Analyses
- 4 Specific Gravity Determinations
- 4 Unit Weight Determinations (Undisturbed samples)
- 1 Triaxial Shear Test with Pore Pressures Monitoring

Detailed descriptions of these tests and the results of our testing are included in the Appendix.

5. SLOPE STABILITY ANALYSIS

5.1 INTRODUCTION

Based on a cross-sectional spacing interval of approximately 200 to 250 feet and considering the topography and nature of the exposed slopes observed, MACTEC developed a modeling approach to assess the global stability of the Ash Pond. Slope stability analyses were conducted using the computer program PCSTABL, developed by Purdue University. The program uses a two-dimensional limit equilibrium method of analysis and calculates the factor of safety based on the Modified Bishop Method of Slices. Our analyses were performed to model the overall stability of the existing dike including steady-state/maximum surcharge pool (flood conditions), rapid drawdown and seismic (dynamic) conditions. Note that steady-state and flood conditions were modeled under one scenario. Three cross-sections (Sections 1 through 3) located along the west and south dikes have been analyzed, the locations of which are shown on the *Boring Location Plan and Slope Stability Section* drawing provided in the Appendix. Modeling of the cross-sections is based on the results of our exploratory drilling and laboratory testing program, the geometry of the upstream and downstream slope configurations, the information derived from our file review and our knowledge of CCW impoundments from past project experience.

The primary guidance documents for the development of our exploration and analyses included: Kentucky Environment and Energy Cabinet, Water Infrastructure Branch, Dam Safety Division Guidelines (primarily Engineering Memorandum Number 5 and KAR 401:030 – Design Criteria for Dams and Associated Structures and "Guidelines for Geotechnical Investigation and Analysis of New and Existing Earth Dams") and the U.S. Army Corps of Engineers Engineering Manual (USACE) EM 1110-2-1902. In addition, the "Engineering and Design Manual" (dated May 2009) by Mine Safety and Health Administration (MSHA) was referenced for seismic stability analyses. These guidance documents suggest a Factor of Safety (FOS) of 1.5 for long-term, steady-state conditions using maximum storage pool (EM 1110-2-1902 suggests a FOS of 1.4 for long-term, steady-state conditions using maximum surcharge pool); a FOS of 1.2 for rapid drawdown (EM 1110-2-1902 suggests a FOS in the range of 1.1-1.3); and a FOS of 1.0 for seismic conditions (MSHA suggests a FOS of 1.2 for seismic conditions).

5.2 GEOMETRY

The slope stability models are based on the geometric slope conditions (interior and exterior slopes) and the geometry of the subsurface soil strata. As previously stated, the Ash Pond is partially diked with a side-hill configuration, with approximately 800 linear feet of embankment on the west and south side of the pond. Our geotechnical exploration and modeling approach focused on the diked portion of the impoundment, with cross-sections for stability analyses at approximate 200 to 250 foot intervals. The typical crest elevation was reported to be 1,015 feet NGVD. Based on our interpolation of the boring locations from the provided topographic mapping, we found that the crest elevation ranges from 1,013.7 feet on the north portion of the west dike (Boring B-1C) to 1,014.6 feet on the east portion of the south dike (Boring B-3C). The typical crest width was reported to be 12 feet. The reported bottom of pond elevation of 1,000 feet NGVD was used in our analyses.

The downstream (exterior) and upstream (interior) slope faces were nominally reported to be 2.5H:1V (horizontal to vertical). Based on the topographic data provided, the upstream slopes for Sections 1 through 3 were observed to range from 2.9H:1V to 5.6H:1V and the downstream slopes ranged from 1.8H:1V to 4.1H:1V. The upstream slopes below the current water or ash levels were projected from the topographic data obtained in the field at each cross-section location from the portion of the upstream slope above the water/CCW level down to the bottom of pond elevation of 1,000 feet NGVD. Due to the variation in slopes observed, the specific topographic survey data at each cross-section location was used for modeling of that section. Slopes used for each section model are summarized in the *Results of Slope Stability Analyses* summary table located in the Appendix.

In addition to the upstream and downstream slopes, crest width and height, the geometry (layering) of the subsurface soil strata were developed for modeling purposes. Layering of the subsurface soils was based on the borings advanced at each cross-section location. One crest boring and one toe boring were used to extrapolate the geometry of the soil layer.

In general, the dike was constructed of silty to sandy clay fill reportedly excavated from a nearby borrow area (as shown on the design drawings provided by KU). The clay fill was placed overlying existing alluvial soils comprised predominately of clay with some sandy soils. Descriptions of the embankment and foundation soils are summarized in Section 4.4 of this report and detailed descriptions at each cross-section analyzed are shown on the Test Boring Records in the Appendix.

5.3 SOIL PARAMETER SELECTION

Once the cross-sections and soil layering were determined, each layer was assigned certain strength parameters required by the modeling software, including unit weight, saturated unit weight, cohesion and internal angle of friction (phi angle). Soil parameters (shown in Table 3 below) selected for the slope stability analyses were chosen based on various resources including the results of the laboratory testing described above, field testing and observations, published information on similar soil types and our experience. The soil strength parameters selected for each cross-section analyzed are shown on the PCSTABL plots in the Appendix.

From a stability modeling standpoint, the soil strata identified in Section 4 were categorized into layers (represented as "Soil Type No." in the modeling software) based on consistency or relative density, for modeling purposes. Additionally, based on our past experience with CCWs and published data, we assigned classification and strength test values for the CCW (Soil Type No. 5 in Table 3).

Table 3. Soil Parameters

Soil Type No.	Soil Description	Unit Weight		Effective Stress	
		Total (pcf)	Saturated (pcf)	Cohesion C' (psf)	Friction Angle Φ' (degrees)
1	CL (fill)	125	130	20	33
2	CL (alluvium)	125	130	0	30
3	SM (alluvium)	128	132	0	28
4	SW (alluvium)	135	140	0	37
5	CCW	90	95	0	30

Calculated By: ALB
Checked By: NGS

5.4 PIEZOMETRIC SURFACES

Based on our borings and piezometer readings, the penetration of water from the impoundment into the existing dike appears to be minimal and the ground water table appears to be at or near the base of the embankment, within the foundation soils. For modeling purposes, water level readings obtained from the piezometers installed in the crest were used to model piezometric surfaces that extended across the pond through the embankments to simulate a "worst case" condition. Water levels in the installed piezometers are shown on the attached Test Boring Records.

For all three modeling scenarios, the unit weight of water contained within the pond was modeled as 62.4 pounds per cubic foot (pcf). For the steady-state/maximum surcharge pool (flood) conditions, the pool elevation was modeled to be equal to the crest elevation in our analyses (ranging from 1,013.7 to 1,014.6 feet). While that scenario is unlikely to occur and does not necessarily represent long term, steady-state conditions, it conservatively models a flood or "worst case" condition. For the rapid drawdown scenario, we modeled the pool elevation dropping rapidly from the long-term, steady-state condition (maximum flood condition) from the crest elevation to the bottom of pond elevation of 1,000 feet NGVD. The water surface was also taken from the top of crest elevation in the seismic (dynamic) condition. All three of these scenarios conservatively employ a "worst case" water level elevation.

5.5 SEISMIC CONDITIONS

Seismic conditions for this site were modeled under dynamic loading conditions using a peak ground acceleration value of 0.126g (horizontally) for a 2 percent probability of exceedance in 50 years. The value was obtained from published guidance based on the site location.

5.6 RESULTS OF ANALYSIS

The results of the analyses for each cross-section selected are shown in the *Results of Slope Stability Analyses* summary table included in the Appendix to this report. In addition, the PCSTABL Plots showing the models and probable failure circles are also included in the Appendix. Based on the guidance documents previously referenced, a slope stability target FOS for dam embankments of 1.5 is recommended for long-term, steady-state (effective stress) stability; a FOS of 1.4 is recommended for maximum surcharge pool/flood (effective stress) conditions; n FOS of 1.2 is recommended for rapid draw-down (effective stress) conditions and an FOS of 1.0 (FOS of 1.2 per MSHA guidance) is recommended for seismic (dynamic) loading (effective stress) conditions. Our analyses, performed using the parameters and geometry described above, indicate that the three cross-sections analyzed exceed the target factors of safety provided in the guidance criteria referenced herein. The ranges in values (minimum and maximum) for the upstream and downstream models, under all three conditions are summarized in the following table.

Table 6. Summary of Slope Stability Analyses

Target Slope	**Long-term, Steady-State/Flood Conditions**		**Rapid Drawdown**		**Seismic**	
	Min	Max	Min	Max	Min	Max
Upstream	3.6	4.0	1.8	2.0	1.6	1.8
Downstream	1.6	2.3	1.6	2.3	1.2	1.6

Calculated By: *ALB*
Checked By: *NGS*

Based on our modeling, the lowest factors of safety were observed for the downstream model of Section 1. The models for this section had the lowest factors of safety indicating that Section 1 is the most "critical" cross-section, yet still yields factors of safety exceeding the regulatory guidelines. Based on the geometry, Section 1 exhibits the steepest downstream slope (1.8H:1V) relative to the other sections modeled, which attributes to the lower factor of safety. Of the three scenarios analyzed, the seismic (dynamic) scenario yielded the lowest factor of safety. Given that this scenario was modeled under "worst case" conditions using a water surface equal to the crest elevation (approximately 4 feet higher in elevation than normal pool), it can be deduced that the factor of safety would increase if the normal pool elevation is applied to the seismic scenario. Further, published guidance suggests a target FOS of 1.0 for seismic scenarios and the target seismic FOS of 1.2 (as published by MSHA) was used in these analyses.

6. CONCLUSIONS

Based on our knowledge of the site gained through our field review of historic documents, drawings and photographs, along with our extensive exploratory drilling, field and laboratory testing programs and the results of our stability analyses, we have concluded that the Ash Pond is structurally stable from a geotechnical standpoint. The results of the slope stability analyses indicate that the three cross-sections analyzed along the 800 feet of embankment meet or exceed the targeted factors of safety as set forth by the Kentucky Environment and Energy Cabinet, Water Infrastructure Branch, Dam Safety Division Guidelines (primarily Engineering Memorandum Number 5 and KAR 401:030 – Design Criteria for Dams and Associated Structures and "Guidelines for Geotechnical Investigation and Analysis of New and Existing Earth Dams"), the U.S. Army Corps of Engineers Engineering Manual (USACE) EM 1110-2-1902 and the "Engineering and Design Manual" (dated May 2009) by Mine Safety and Health Administration (MSHA).

6.1 BASIS FOR CONCLUSIONS

The conclusions provided are based in part on project information provided to MACTEC and only apply to the specific project and site discussed in this report. If the project information section in this report contains incorrect information or if additional information is available, you should convey the correct or additional information to us and retain us to review our conclusions. We can then modify our conclusions if they are inappropriate for the project.

The assessment of site environmental conditions or the presence of contaminants in the soil, rock, surface water or ground water of the site was beyond the scope of this exploration.

Regardless of the thoroughness of a geotechnical exploration, there is always a possibility that conditions between borings will be different from those at specific boring locations.

We wish to remind you that our exploration services include storing the samples collected and making them available for inspection for 60 days. The samples are then discarded unless you request otherwise.

APPENDIX:

Site Location Map

Boring Location Plan and Slope Stability Sections

Field Testing Procedures

Key to Symbols and Descriptions

Test Boring Records

Statistical Analysis of SPT Resistances

Laboratory Testing Procedures

Summary of Laboratory Test Data

Atterberg Limit Test Results

Grain Size Distribution Test Results

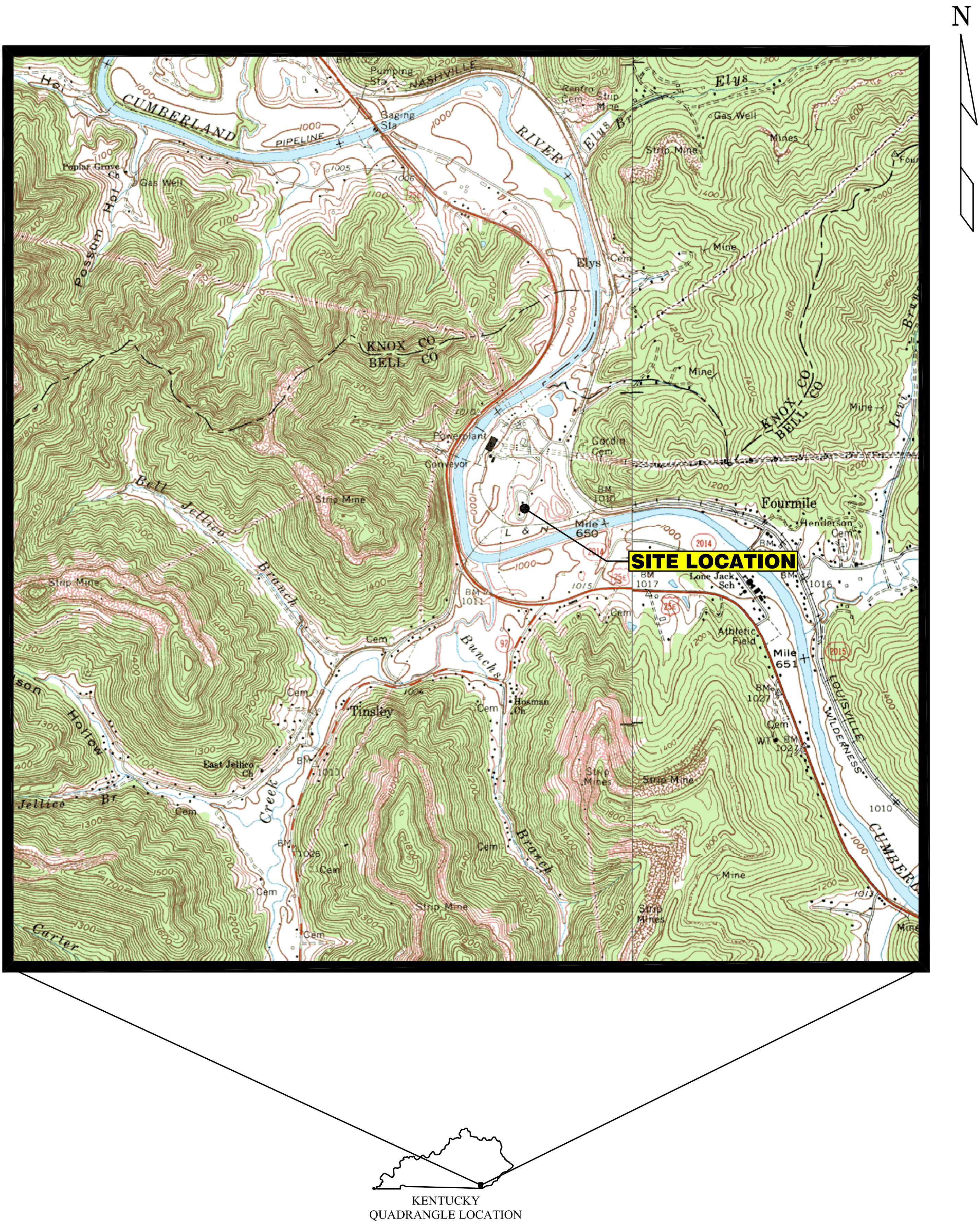
Triaxial Shear Test Results

Summary of Slope Stability Results

PCSTABL Plots

SITE LOCATION MAP

SOURCE: MAPTECH TERRAIN NAVIGATOR, ARTEMUS QUADRANGLE, AERIAL SURVEY 1974.



E.ON U.S. SERVICES, INC.
KENTUCKY UTILITIES
220 WEST MAIN STREET
LOUISVILLE, KENTUCKY 40202
PROJECT NO. 3143-10-1317-03

MACTEC
13425 Eastpoint Centre Drive, Ste 122
Louisville, KY. 40223
Phone: 502-253-2500 Fax: 502-253-2501

CHECKED BY: A.BRENNEMAN
PREPARED BY: G.HAYS

SITE LOCATION MAP
PINEVILLE POWER STATION
BELL COUNTY, KENTUCKY

CADD FILE:101317-03_SLM.dwg
PLOT DATE: 8/26/10

FIGURE 1

BORING LOCATION PLAN AND SLOPE STABILITY SECTIONS

Source: Original drawing provided by Kimball Corp.

REV	DATE	BY	DESCRIPTION

SEAL

DESIGNED A.BRENNEMAN
DRAWN G.HAYS
CHECKED A.BRENNEMAN
IN CHARGE N.SCHMITT
DATE 8/10/10

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BORING LOCATION PLAN AND SLOPE STABILITY SECTIONS
PINEVILLE POWER STATION
FOURMILE
BELL COUNTY, KENTUCKY

SCALE GRAPHIC
MACTEC PROJECT NO. 3143-10-1317-03
DWG. NO. 2

CADD FILE: 101317-03_Tyrone.dwg
PLOT DATE: 8/10/10

KEY TO SYMBOLS AND DESCRIPTIONS

LOGS OF BORINGS

MACTEC KEY TO SYMBOLS AND DESCRIPTIONS

Group Symbols	Typical Names
GW	Well graded gravels, gravel - sand mixtures, little or no fines.
GP	Poorly graded gravels or gravel - sand mixtures, little or no fines.
GM	Silty gravels, gravel - sand - silt mixtures.
GC	Clayey gravels, gravel - sand - clay mixtures.
SW	Well graded sands, gravelly sands, little or no fines.
SP	Poorly graded sands or gravelly sands, little or no fines.
SM	Silty sands, sand - silt mixtures
SC	Clayey sands, sand - clay mixtures.
ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts and with slight plasticity.
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
OL	Organic silts and organic silty clays of low plasticity.
MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
CH	Inorganic clays of high plasticity, fat clays
CL-CH	Inorganic clays ranging from low to high plasticity (combination of CL and CH above)
OH	Organic clays of medium to high plasticity
PT	Peat and other highly organic soils.
Top-Soil	The upper portion of a soil, usually dark colored and rich in organic material.
FILL	Fill soils are materials that have been transported to their present location by man.
Lime-stone	A sedimentary rock consisting predominantly of calcium carbonate
Sand-stone	A sedimentary rock consisting of sand consolidated with some cement (clay or quartz etc.)
Silt-stone	A fine-grained rock of consolidated silt.
Shale	A fine-grained sedimentary rock consisting of compacted and hardened clay, silt, or mud.
PWR	Partially Weathered Rock

Boundary Classifications:
Soils possessing characteristics of two groups are designated by combinations of group symbols.

Undisturbed Sample (UD or SH)	Auger Cuttings (AU)
Split Spoon Sample (SS or SPT)	Bulk Sample (BK) or Grab Sample (GS)
Rock Core (RC)	No Recovery (NR)
Water Table at time of drilling	Water Table after drilling
WOH - Weight of Hammer	C Cave Depth

Correlation of Penetration Resistance (N) with Relative Density and Consistency

SAND & GRAVEL		SILT & CLAY	
Relative Density	No. of Blows	Consistency	No. of Blows
Very Loose	0 to 4	Very Soft	0 to 1
Loose	5 to 10	Soft	2 to 4
Firm	11 to 20	Firm	5 to 8
Very Firm	21 to 30	Stiff	9 to 15
Dense	31 to 50	Very Stiff	16 to 30
Very Dense	Over 50	Hard	Over 30

Standard Penetration Resistance The Number of Blows of a 140 lb. Hammer Falling 30 in. Required to Drive a 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1586. Also commonly referred to as an "N" value.

Estimated Relative Moisture Condition

Visual classification relative to assumed optimum moisture content (OMC) of standard proctor

Dry:	Air dry to dusty
Slightly Moist:	Dusty to approximately -2% OMC
Moist:	Approximately between ±2% OMC
Very Moist:	From approximately +2% to nearly saturated
Wet:	Contains free water or nearly saturated

Relative Hardness of Rock

Very Soft:	Can be broken with fingers
Soft:	Can be scratched with fingernail; Only edges can be broken with fingers
Moderately Hard:	Can be easily scratched with knife; Cannot be scratched with fingernail
Hard:	Difficult to scratch with knife; Hard hammer blow to break specimen
Very Hard:	Cannot be scratched with knife; Several hard hammer blows to break specimen

Rock Continuity

Core Recovery	Description
0 - 40%	Incompetent
40 - 70%	Competent
70 - 90%	Fairly Continuous
90 - 100%	Continuous

Rock Quality Designation

RQD	Rock Quality Classification
< 25%	Very Poor
25 - 50%	Poor
50 - 75%	Fair
75 - 90%	Good
90 - 100%	Very Good

REC Recovery - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%

RQD Rock Quality Designation - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.

SILT OR CLAY	SAND			GRAVEL		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

No.200 No.40 No.10 No.4 3/4" 3" 12"

U.S. STANDARD SIEVE SIZE

Reference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. 1, March, 1953 (Revised April, 1960)

DEPTH (ft)	DESCRIPTION SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS *Note: No information on the borings should be used without considering the entire content of the main document.*
0	TOPSOIL; FILL	1013.7										SURFACE COVER: GRASS
	STIFF, Orange brown to red brown, silty, lean CLAY (CL) with sand and oxide nodules, moist; FILL		SS-1	SS	18	3-5-7 (N = 12)	13.6					
5		1008.7	SS-2	SS	18	4-4-7 (N = 11)	19.1					
			UD-1	UD	14							
	STIFF, Light brown and gray, silty, lean CLAY (CL) with sand, trace organics, moist; FILL											
10		1003.7	SS-3	SS	18	3-4-7 (N = 11)	21.3					
			UD-2	UD	24							
	FIRM, Orange brown and light gray, silty, lean CLAY (CL) with sand, moist; ALLUVIUM											DEPTH OF WATER IN PZ AT 13.5 FEET ON 08/25/10
15		998.7	SS-4	SS	18	1-2-4 (N = 6)	23.7					
	STIFF, Red brown and gray, silty, lean CLAY (CL) with sand, moist; ALLUVIUM											
20		993.7	SS-5	SS	18	2-4-6 (N = 10)	21.3					
	FIRM, Tan and gray, silty, lean CLAY (CL) with sand, moist; ALLUVIUM											WATER ON DRILLING TOOLS AT 21.0 FEET
25	∇	988.7	SS-6	SS	18	6-3-4 (N = 7)	21.7					PIEZOMETER INSTALLED WITH SCREENED INTERVAL FROM 25-35 FEET
	LOOSE, Tan and orange brown, silty SAND (SM), wet; ALLUVIUM		UD-3	UD	12		20.4				31	
30		983.7	SS-7	SS	18	2-3-2 (N = 5)	20.4				29	
	DENSE, Orange brown, gravelly SAND (SW), trace fines; ALLUVIUM											
35		978.7	SS-8	SS	18	20-21-16 (N = 37)						
	BORING TERMINATED AT 35.5 FEET											
40		973.7										

START DATE: 8/13/2010
CONTRACTOR: Hoosier Drilling
DRILLER: Gary Taylor
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: E.ON U.S. - Pineville Power Station

Project No: 3143-10-1317.03

Checked By: ADS **Boring No.: B-1C**

MACTEC

TEST BORING RECORD

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	DESCRIPTION	ELEV MSL (ft)	Sample Number	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD / % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS
0	TOPSOIL; FILL	1000.6									SURFACE COVER: GRASS
	FIRM, Orange brown, silty, lean CLAY (CL) with sand, trace organic; FILL		SS-1	18	2-2-3 (N = 5)	21.4					
	STIFF, Orange brown, silty, lean CLAY (CL) with sand; ALLUVIUM										
5		995.6	SS-2	18	2-4-5 (N = 9)	20.1	35	21			
			UD-1	0							
	STIFF to FIRM, Orange brown and gray, silty, lean CLAY (CL), with sand; ALLUVIUM										
10		990.6	SS-3	18	2-4-5 (N = 9)	25.3					
	C										BORING CAVED IN AT A DEPTH OF 12.0 FEET UPON COMPLETION OF DRILLING
15		985.6	SS-4	18	2-3-4 (N = 7)	20.7					
	BORING TERMINATED AT 15.5 FEET										BORING DRY UPON COMPLETION OF DRILLING
20		980.6									

Note: *No information on the borings should be used without considering the entire content of the main document.*

START DATE: 8/13/2010
CONTRACTOR: Hoosier Drilling
DRILLER: Gary Taylor
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: E.ON U.S. - Pineville Power Station
Project No: 3143-10-1317.03
Checked By: [signature] **Boring No.: B-1T**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101317.03.GPJ MACTEC DATABASE TEMPLATE 01.GDT 8/30/10

Depth (ft)	Description	Elev MSL (ft)	Sample Number	Recovery (in.)	N-Count (1st 6" 2nd 6" 3rd 6") / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	Remarks
0	TOPSOIL; FILL	1014.2									SURFACE COVER: GRASS
	STIFF, Light brown and tan, silty, lean CLAY (CL) with sand, moist; FILL		SS-1	18	9-6-6 (N = 12)	14.2					
5	FIRM, Orange brown and light gray, silty, lean CLAY (CL) with sand, moist; FILL	1009.2	UD-1	8							
			SS-2	18	3-3-5 (N = 8)	20.0					
			UD-2	22		21.1	38	20		82	
10		1004.2									
15	FIRM, Gray, SILTY CLAY (CL-ML), moist; ALLUVIUM	999.2	SS-3	18	3-2-3 (N = 5)	19.6					
			UD-3	24							
20	FIRM, Brown and gray, SILTY CLAY (CL-ML), moist to wet; ALLUVIUM	994.2									
25	LOOSE, Brown and gray, silty SAND (SM), wet; ALLUVIUM	989.2	SS-4	18	2-2-4 (N = 6)	26.8	24	17			
	STIFF, Orange brown, silty, lean CLAY (CL) with sand, moist; ALLUVIUM										
30		984.2	SS-5	18	3-4-5 (N = 9)	20.4					WATER ON DRILLING TOOLS AT 31.0 FEET
	HARD, gravelly CLAY (CL), ALLUVIUM										BORING CAVED IN AT A DEPTH OF 33.0 FEET UPON COMPLETION OF DRILLING
35	BORING TERMINATED AT 35.0 FEET	979.2	SS-6	0	23-19-21 (N = 40)						
40		974.2									

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

Note: *No information on the borings should be used without considering the entire content of the main document.*

C

START DATE: 8/13/2010
CONTRACTOR: Hoosier Drilling
DRILLER: Gary Taylor
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: E.ON U.S. - Pineville Power Station
Project No: 3143-10-1317.03
Checked By: AOS **Boring No.: B-2C**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 314310131 7.03.GPJ MACTEC DATABASE TEMPLATE 01.GDT 8/30/10

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: No information on the borings should be used without considering the entire content of the main document.)
0	TOPSOIL; FILL	1000.2										SURFACE COVER: GRASS
	STIFF, Dark brown, silty, lean CLAY (CL) with sand, trace organics, moist; FILL		SS-1		18	4-6-5 (N = 11)	16.9					
	STIFF, Orange brown, silty, lean CLAY (CL) with sand, moist; ALLUVIUM											
5		995.2	SS-2		18	4-6-6 (N = 12)	29.1					
			UD-1		0							
10		990.2										
	LOOSE, Orange brown, silty SAND (SM), wet; ALLUVIUM											WATER ON DRILLING TOOLS AT 13.0 FEET
15	C	985.2	SS-3		18	3-3-4 (N = 7)	22.2					BORING CAVED IN AT A DEPTH OF 15.0 FEET UPON COMPLETION OF DRILLING
	BORING TERMINATED AT 15.5 FEET											
20		980.2										

START DATE: 8/13/2010
CONTRACTOR: Hoosier Drilling
DRILLER: Gary Taylor
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: E.ON U.S. - Pineville Power Station
Project No: 3143-10-1317.03
Checked By: [signature] **Boring No.: B-2T**

MACTEC

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	ELEV MSL (ft)	Sample Number	Sample Type	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: No information on the borings should be used without considering the entire content of the main document.)
0	TOPSOIL; FILL	1014.6										SURFACE COVER: GRASS
	STIFF, Orange brown and brown, silty, lean CLAY (CL) with sand, moist; FILL		SS-1		18	4-5-6 (N = 11)	15.4					
			SS-2		18	5-6-6 (N = 12)						
5		1009.6										
			UD-1		20		23.9	47	28		82	
	STIFF, Brown and dark gray, silty, lean CLAY (CL) with sand, moist; FILL											
10		1004.6	SS-3		18	5-5-5 (N = 10)	20.4					
	FIRM, Orange brown, silty, lean CLAY (CL) with sand, moist; ALLUVIUM		UD-2		20							
15		999.6	SS-4		18	2-2-3 (N = 5)	25.2					PIEZOMETER INSTALLED WITH SCREENED INTERVAL FROM 15-25 FEET
	FIRM, Brown and gray, silty CLAY (CL) with sand, trace organics at 19.0 Feet; ALLUVIUM		UD-3		18		22.7	43	24		82	
20		994.6	SS-5		18	2-2-3 (N = 5)	26.2					DEPTH OF WATER IN PZ AT 16.4 FEET ON 08/25/10
25		989.6	SS-6		18	1-2-3 (N = 5)	22.7					
30		984.6	SS-7		18	2-2-4 (N = 6)	32.1					
	STIFF, Brown and gray, silty, lean CLAY (CL) with sand, moist; ALLUVIUM											
35		979.6	SS-8		18	4-5-7 (N = 12)						
	STIFF, Gray, silty, lean CLAY (CL) with sand; ALLUVIUM											
	BORING TERMINATED AT 35.5 FEET											BORING DRY UPON COMPLETION OF DRILLING
40		974.6										

START DATE: 8/13/2010
CONTRACTOR: Hoosier Drilling
DRILLER: Gary Taylor
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: E.ON U.S. - Pineville Power Station
Project No: 3143-10-1317.03
Checked By: **Boring No.: B-3C**

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101317.03.GPJ MACTEC DATABASE TEMPLATE 01.GDT 8/30/10

DEPTH (ft)	DESCRIPTION (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	ELEV MSL (ft)	Sample Number	RECOV (in.)	N-COUNT 1st 6" 2nd 6" 3rd 6" / RQD % REC	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Unconfined Compression (psf-soil; psi-rock)	Percent Passing #200 Sieve	REMARKS (Note: No information on the borings should be used without considering the entire content of the main document.)
0	TOPSOIL; FILL	1001.7									SURFACE COVER: GRASS
	FIRM, Orange brown, silty, lean CLAY (CL) with sand, trace gravel, dry; FILL		SS-1	16	6-5-3 (N = 8)	17.1					
	STIFF, Brown and gray, silty, lean CLAY (CL) with sand, moist; ALLUVIUM										
5		996.7	SS-2	16	3-4-6 (N = 10)	21.0					
	FIRM, Tan and gray, silty, lean CLAY (CL) with sand, moist; ALLUVIUM		UD-1	0							
10	∇	991.7	SS-3	18	2-3-4 (N = 7)	24.2	30	21			
	C										BORING CAVED IN AT A DEPTH OF 13.0 FEET UPON COMPLETION OF DRILLING
15		986.7	SS-4	18	2-2-4 (N = 6)	21.3					
	BORING TERMINATED AT 15.5 FEET										
20		981.7									

START DATE: 8/13/2010
CONTRACTOR: Hoosier Drilling
DRILLER: Gary Taylor
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA.: 3¼" ID
HAMMER: Automatic
LOGGED BY: Nick Jones
PREPARED BY: Sarah Sheilley
REMARKS:

TEST BORING RECORD

Project: E.ON U.S. - Pineville Power Station
Project No: 3143-10-1317.03
Checked By: SAB
Boring No.: B-3T

MACTEC

MACTEC SOIL-ROCK (SITE MAP) 3143101317.03.GPJ MACTEC DATABASE TEMPLATE 01.GDT 8/30/10

MACTEC

Project:	Pineville Power Station		
Project No.:	3143-10-1317.03		
Prepared By:	NRJ	Date:	09/08/10
Checked By:	ALB	Date:	09/08/10

Statistical Analysis of Standard Penetration Test (SPT) Resistances (N-values)

Depth (feet)	B-1C	B-2C	B-3C	Min.	Max.	Std. Dev.	Var.	Avg.
0.0	12	12	11	11	12	0	0	11
4.0	11	8	12	8	12	2	4	10
9.0	11		10	10	11	0	0	10
14.0	6	5	5	5	6	0	0	5
19.0	10		5	5	10	3	12	7
24.0	7	6	5					
29.0	5	9	6	5	9	2	4	6
34.0	37	40	12	12	40	15	236	29
39.0								
				5	40	9	83	10

KEY

Lean CLAY (CL), FILL
Lean CLAY (CL), ALLUVIUM
SILTY CLAY (CL-ML), ALLUVIUM
Silty SAND (SM), ALLUVIUM
Gravelly SAND (SW), ALLUVIUM

Project:	Pineville Power Station			
Project No.:	3143-10-1317.03			
Prepared By:	NRJ	Date:	9/8/2010	
Checked By:	ALB	Date:	9/8/2010	

Statistical Analysis of Standard Penetration Test (SPT) Resistances (N-values)

Depth (feet)	B-1T	B-2T	B-3T	Min.	Max.	Std. Dev.	Var.	Avg.
0.0	5	11	8	5	11	3	9	8
4.0	9	12	10	9	12	1	2	10
9.0	9		7	7	9	1	2	8
14.0	7	7	6	6	7	0	0	6
19.0								
24.0								
				5	12	2	4	8

KEY

Lean CLAY (CL), FILL
Lean CLAY (CL), ALLUVIUM
SILTY CLAY (CL-ML), ALLUVIUM
Silty SAND (SM), ALLUVIUM
Gravelly SAND (SW), ALLUVIUM

SUMMARY OF LABORATORY RESULTS

Borehole	Depth	Sample Type	Atterberg Limits			USCS Class-ification	Natural Moisture Content (%)	Unconfined Compress. Strength (Soil-psf)	Organic Content	Unit Weight (pcf)		Maximum Dry Density (pcf)	Optimum Moisture Content (%)	pH	Rock Core		% Finer #200
			Liquid Limit	Plastic Limit	Plasticity Index					Dry Density	Wet Density				RQD	Percent Recovery	
B-1C	0.0-1.5	SS					13.6										
B-1C	4.0-5.5	SS					19.1										
B-1C	9.0-10.5	SS					21.3										
B-1C	14.0-15.5	SS					23.7										
B-1C	19.0-20.5	SS					21.3										
B-1C	24.0-25.5	SS					21.7										
B-1C	26.0-28.0	UD				SM	20.4			106.7	128.4						31
B-1C	29.0-30.5	SS				SM	20.4										29
B-1T	0.0-1.5	SS					21.4										
B-1T	4.0-5.5	SS	35	21	14	CL	20.1										
B-1T	9.0-10.5	SS					25.3										
B-1T	14.0-15.5	SS					20.7										
B-2C	0.0-1.5	SS					14.2										
B-2C	6.0-7.5	SS					20.0										
B-2C	8.0-10.0	UD	38	20	18	CL	21.1			109.8	133.0						82
B-2C	14.0-15.5	SS					19.6										
B-2C	24.0-25.5	SS	24	17	7	CL-ML	26.8										
B-2C	29.0-30.5	SS					20.4										
B-2T	0.0-1.5	SS					16.9										
B-2T	4.0-5.5	SS					29.1										
B-2T	14.0-15.5	SS					22.2										
B-3C	0.0-1.5	SS					15.4										
B-3C	4.0-5.5						17.8										
B-3C	5.0-7.0	UD	47	28	19	CL	23.9			102.7	127.2						82
B-3C	9.0-10.5	SS					20.4										
B-3C	14.0-15.5	SS					25.2										

Remarks:

* SPT/SS = Split-spoon   BG = Bulk / bag sample
UD/SH = Undisturbed sample   RC = Rock core

Summary of Laboratory Results

Project: E.ON U.S. - Pineville Power Station
Project No: 3143-10-1317.03
Checked By: [illegible]

MACTEC

MACTEC_LAB-SUMMARY LANDSCAPE (ORGANICS) 3143101317.03.GPJ MACTEC DATABASE TEMPLATE 01.GDT 8/25/10

Borehole	Depth	Sample Type	Atterberg Limits			USCS Classification	Natural Moisture Content (%)	Unconfined Compress. Strength (Soil-psf)	Organic Content	Unit Weight (pcf)		Maximum Dry Density (pcf)	Optimum Moisture Content (%)	pH	Rock Core		% Finer #200
			Liquid Limit	Plastic Limit	Plasticity Index					Dry Density	Wet Density				RQD	Percent Recovery	
B-3C	16.0-18.0	UD	43	24	19	CL	22.7			100.8	123.7						82
B-3C	19.0-20.5	SS					26.2										
B-3C	24.0-25.5	SS					22.7										
B-3C	29.0-30.5	SS					32.1										
B-3T	0.0-1.5	SS					17.1										
B-3T	4.0-5.5	SS					21.0										
B-3T	9.0-10.5	SS	30	21	9	CL	24.2										
B-3T	14.0-15.5	SS					21.3										

Remarks:

* SPT/SS = Split-spoon BG = Bulk / bag sample
UD/SH = Undisturbed sample RC = Rock core

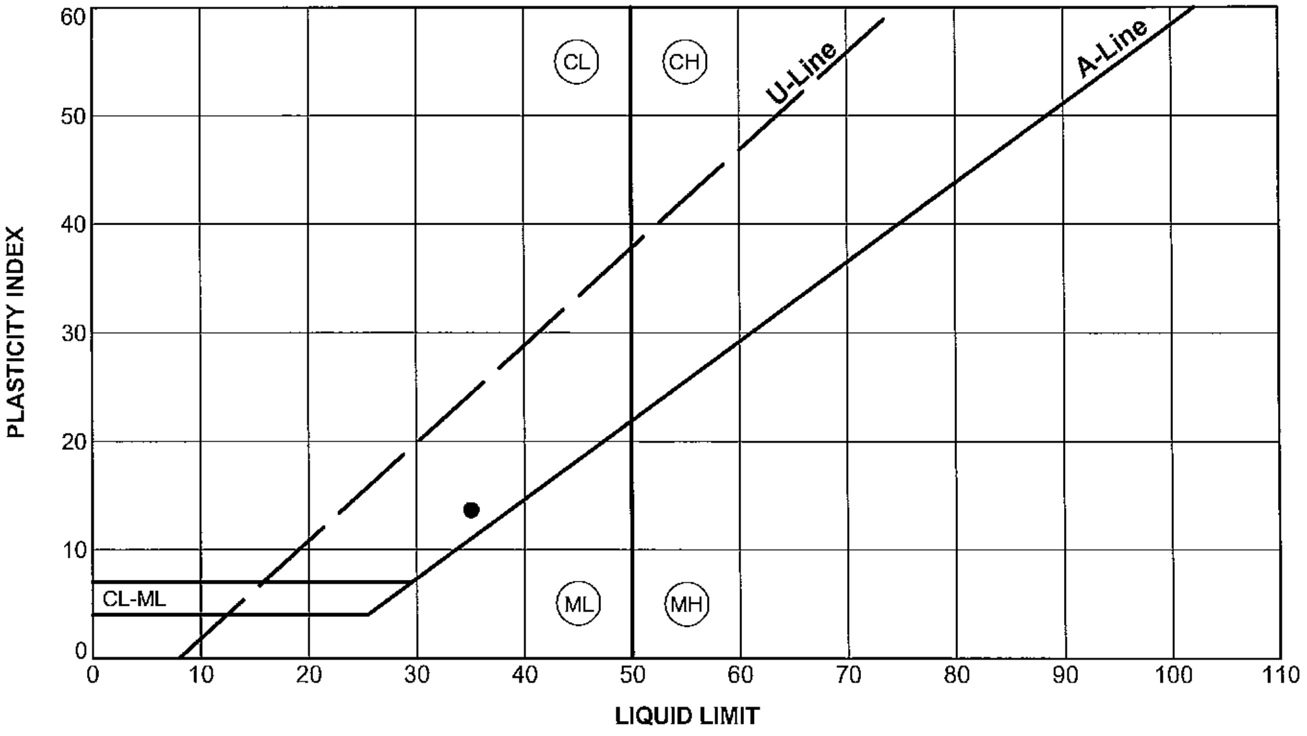
Summary of Laboratory Results

Project: E.ON U.S. - Pineville Power Station
Project No: 3143-10-1317.03
Checked By: ________

MACTEC

MACTEC_LAB-SUMMARY LANDSCAPE (ORGANICS) 3143101317.03.GPJ MACTEC DATABASE TEMPLATE 01.GDT 8/25/10

ATTERBERG LIMITS TEST RESULTS



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-1T	4.0-5.5	35	21	14	20.1	-0.1	CL	Sandy Brown, silty, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

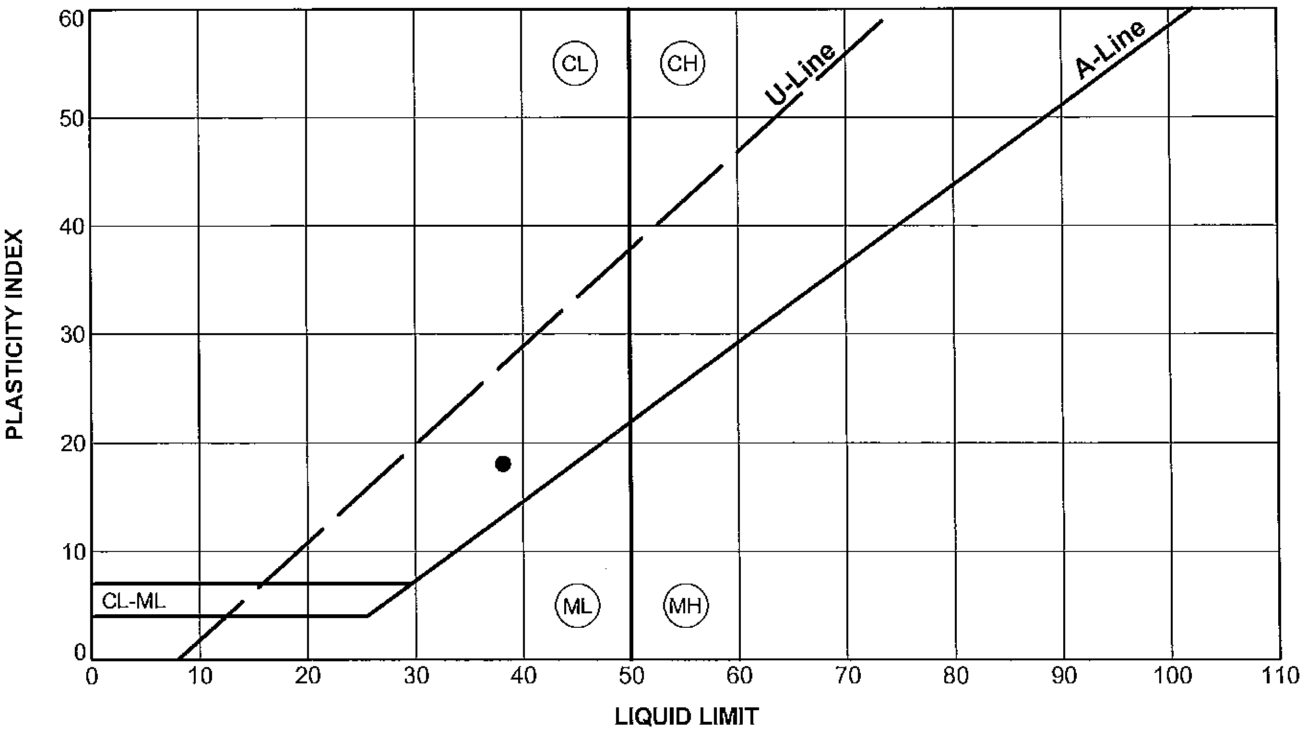
Project: E.ON U.S. - Pineville Power Station

Project No: 3143-10-1317.03

Checked By: ____

MACTEC

MACTEC_ATTERBERG_LIMITS 3143101317.03.GPJ MACTEC DATABASE TEMPLATE 01.GDT 8/25/10



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-2C	8.0-10.0	38	20	18	21.1	0.1	CL	Yellowish brown, silty, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

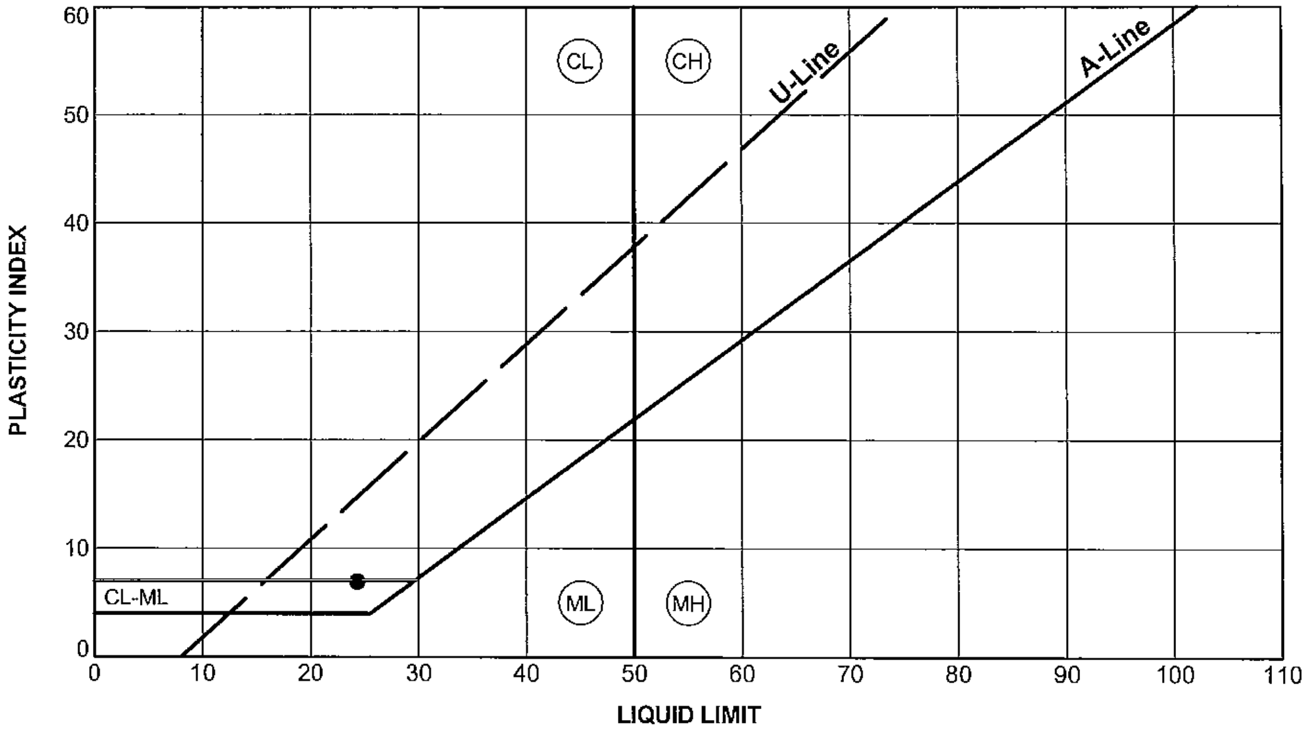
Project: E.ON U.S. - Pineville Power Station

Project No: 3143-10-1317.03

Checked By: Ads

MACTEC

MACTEC_ATTERBERG_LIMITS 3143101317.03.GPJ MACTEC DATABASE TEMPLATE 01.GDT 8/25/10



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-2C	24.0-25.5	24	17	7	26.8	1.4	CL-ML	Light brown, silty CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

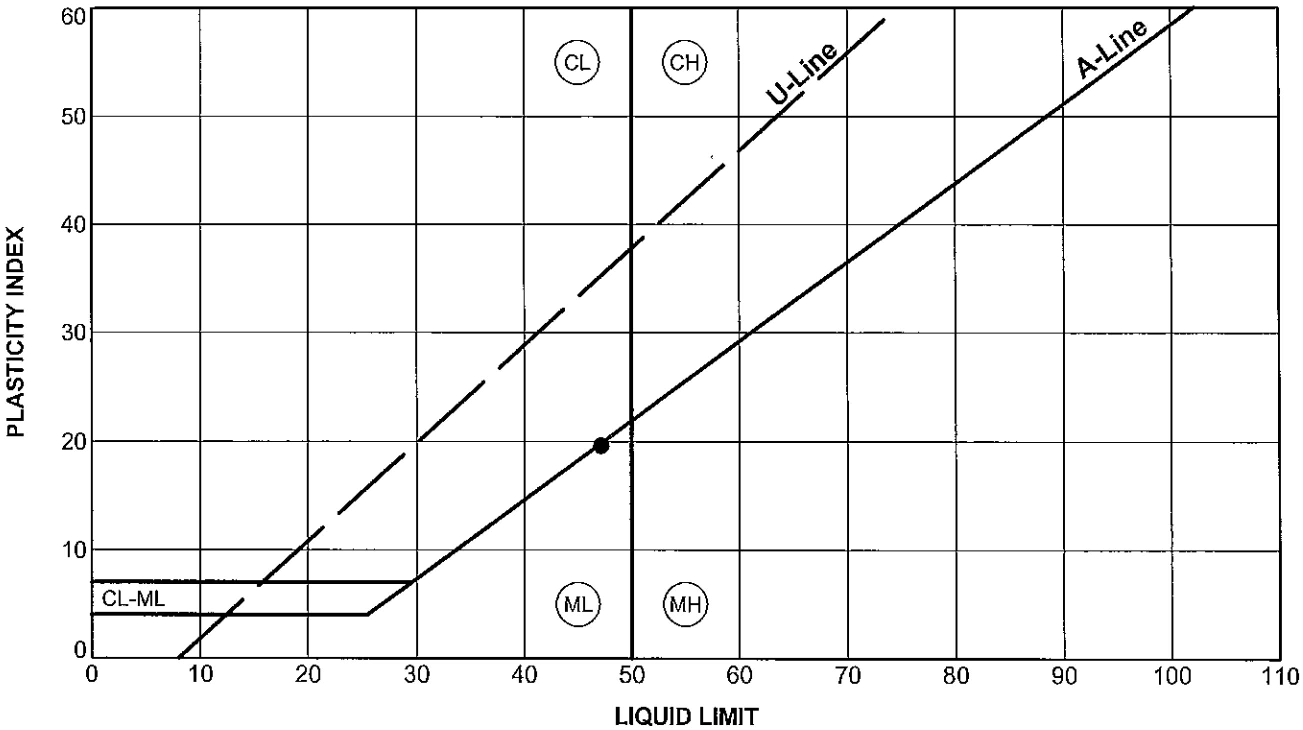
Project: E.ON U.S. - Pineville Power Station

Project No: 3143-10-1317.03

Checked By: [signature]

MACTEC

MACTEC_ATTERBERG_LIMITS 3143101317.03.GPJ MACTEC DATABASE TEMPLATE 01.GDT 8/25/10



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-3C	5.0-7.0	47	28	19	23.9	-0.2	CL	Yellowish brown, silty, lean CLAY

MACTEC_ATTERBERG_LIMITS 3143101317.03.GPJ MACTEC DATABASE TEMPLATE 01.GDT 8/25/10

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

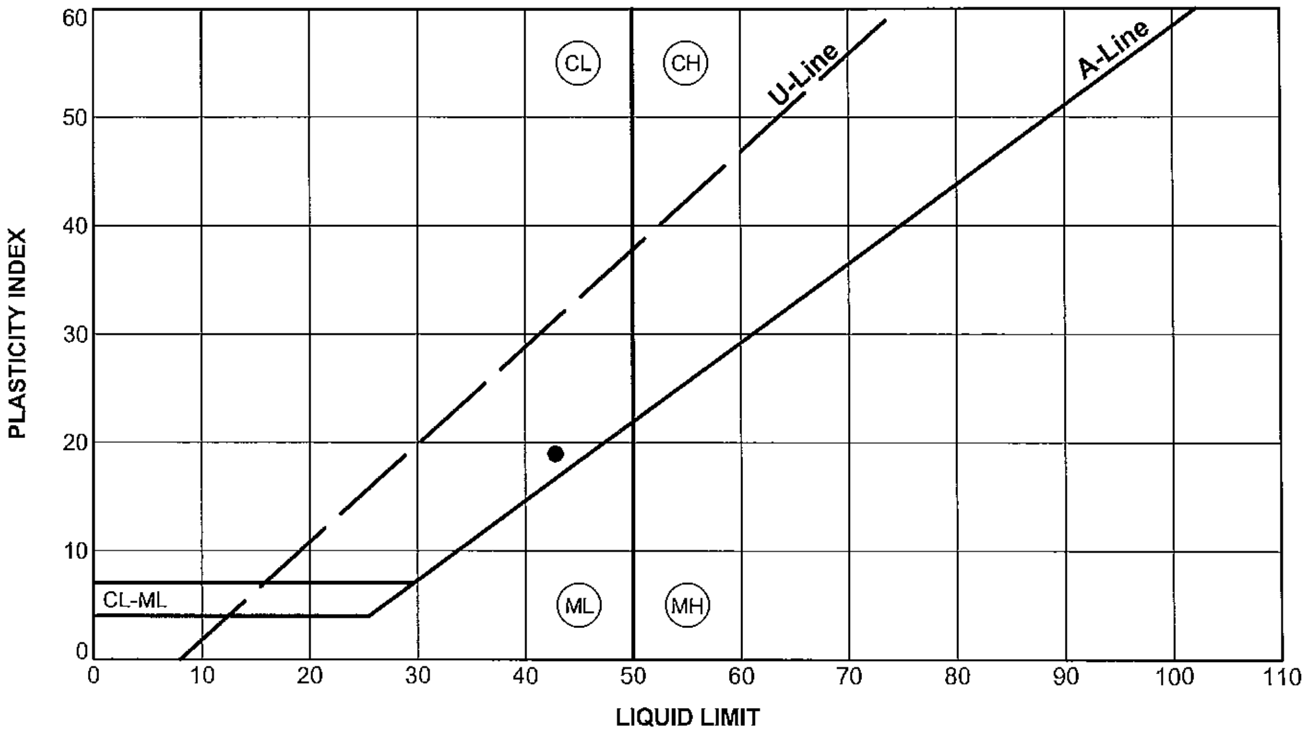
ATTERBERG LIMITS RESULTS

Project: E.ON U.S. - Pineville Power Station

Project No: 3143-10-1317.03

Checked By: ADS

MACTEC



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-3C	16.0-18.0	43	24	19	22.7	-0.1	CL	Dark brown, silty, lean CLAY

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

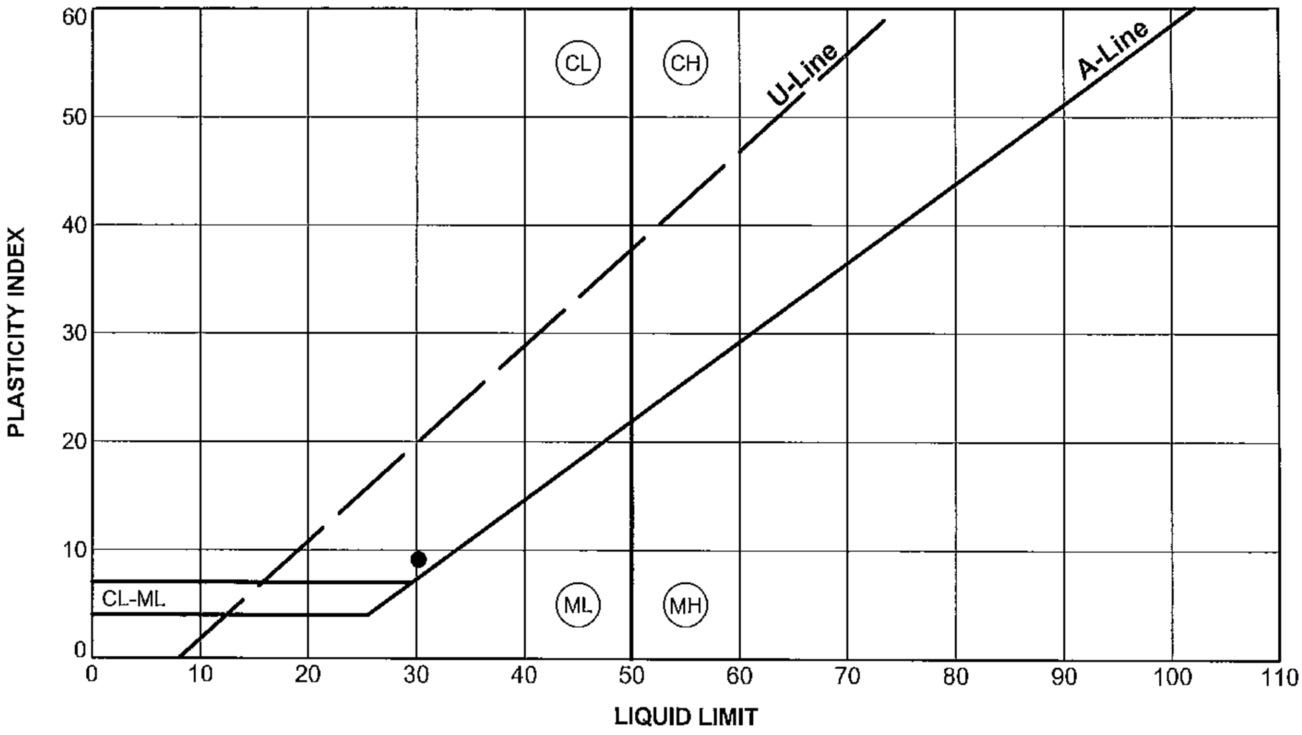
Project: E.ON U.S. - Pineville Power Station

Project No: 3143-10-1317.03

Checked By: [signature]

MACTEC

MACTEC_ATTERBERG_LIMITS 314310317.03.GPJ MACTEC DATABASE TEMPLATE 01.GDT 8/25/10



Symbol	Location	Depth, feet	LL	PL	PI	Natural Moisture Content, %	LI	USCS	Soil Classification
●	B-3T	9.0-10.5	30	21	9	24.2	0.3	CL	Yellowish brown, silty, lean CLAY

MACTEC_ATTERBERG_LIMITS 31431013 17.03.GPJ MACTEC DATABASE TEMPLATE 01.GDT 8/30/10

Remarks:

Test Method - ASTM D4318

LL=Liquid Limit; PL= Plastic Limit; PI=Plasticity Index; LI=Liquidity Index

ATTERBERG LIMITS RESULTS

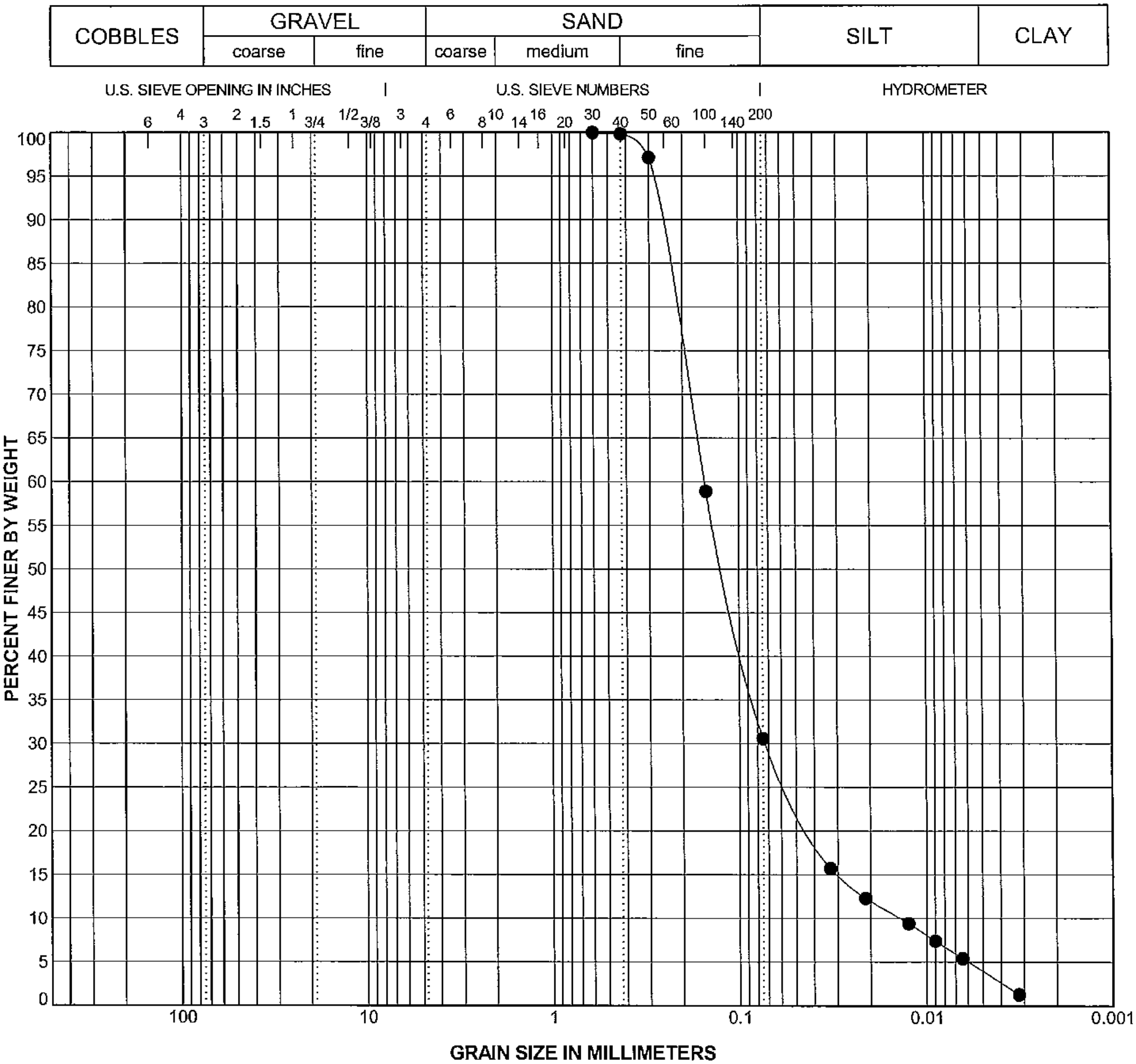
Project: E.ON U.S. - Pineville Power Station

Project No: 3143-10-1317.03

Checked By: ADG

MACTEC

GRAIN SIZE DISTRIBUTION TEST RESULTS



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-1C	26.0-28.0	Yellow, silty SAND	SM	0.6	0.153	0.073	0.014	2.47	10.96

MACTEC_GRAIN_SIZE 3143101317.03.GPJ LAW_GIBB.GDT 8/25/10

Remarks:

Test Method - ASTM D422

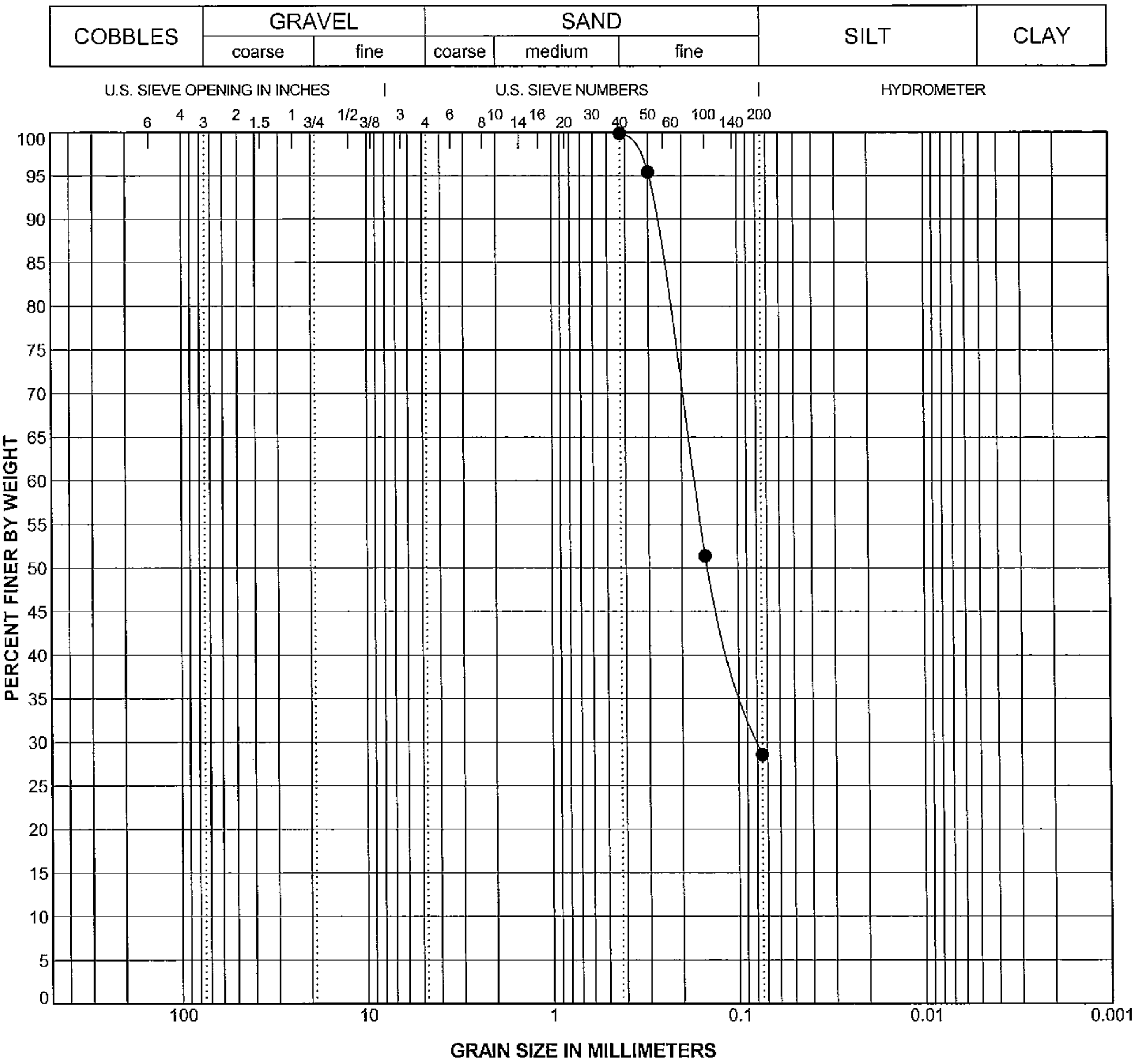
GRAIN SIZE DISTRIBUTION

Project: E.ON U.S. - Pineville Power Station

Project No: 3143-10-1317.03

Checked By: ADS

MACTEC



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-1C	29.0-30.5	Orange brown, silty SAND	SM	0.425	0.172	0.078			

MACTEC_GRAIN_SIZE 3143101317.03.GPJ LAW_GIBB.GDT 8/25/10

Remarks:

Test Method - ASTM D422

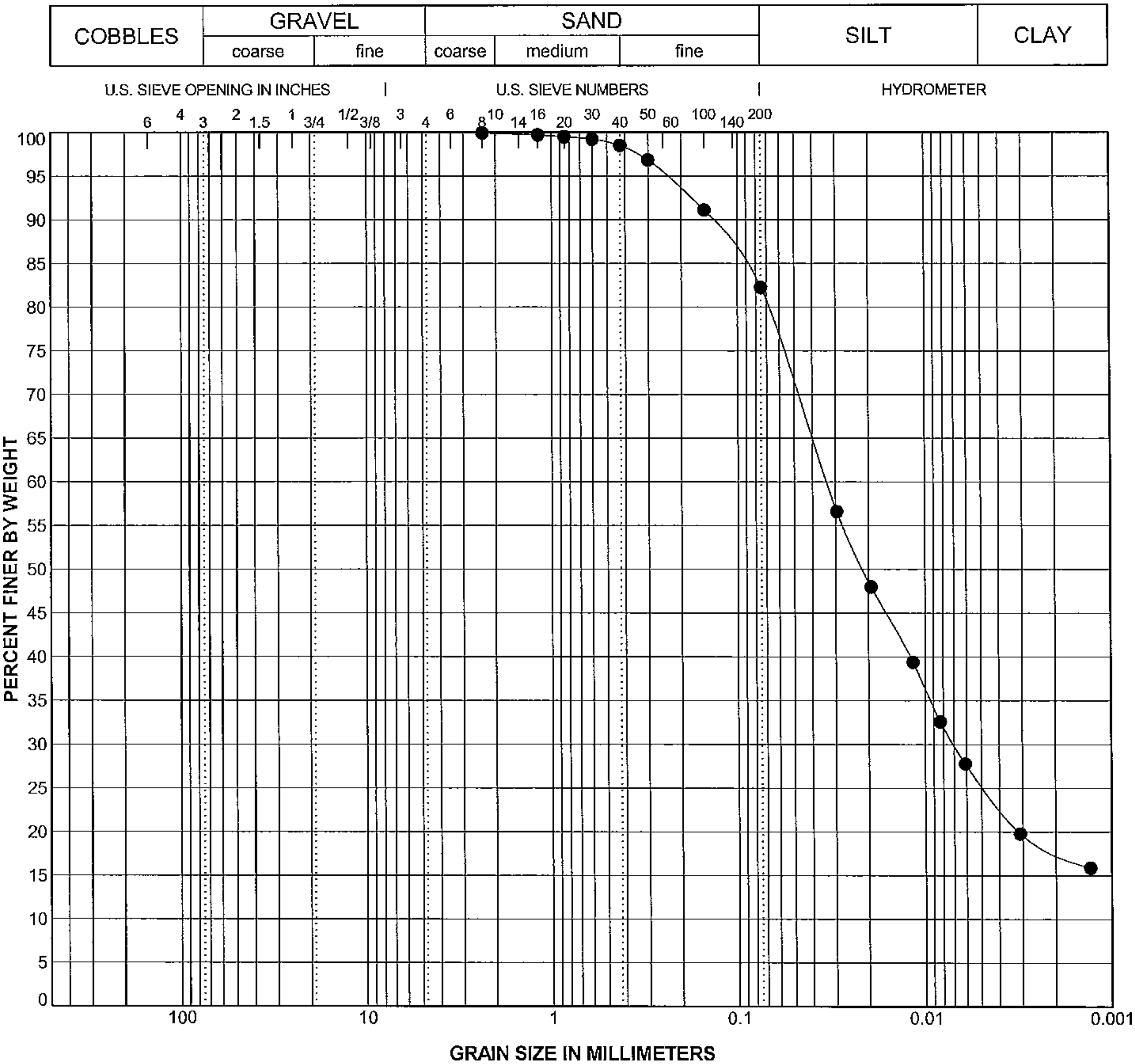
GRAIN SIZE DISTRIBUTION

Project: E.ON U.S. - Pineville Power Station

Project No: 3143-10-1317.03

Checked By: [illegible]

MACTEC



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-2C	8.0-10.0	Yellowish brown, silty, lean CLAY	CL	2.36	0.033	0.007			

MACTEC_GRAIN_SIZE 3143101317.03.GPJ LAW_GIBB.GDT 8/25/10

Remarks:

Test Method - ASTM D422

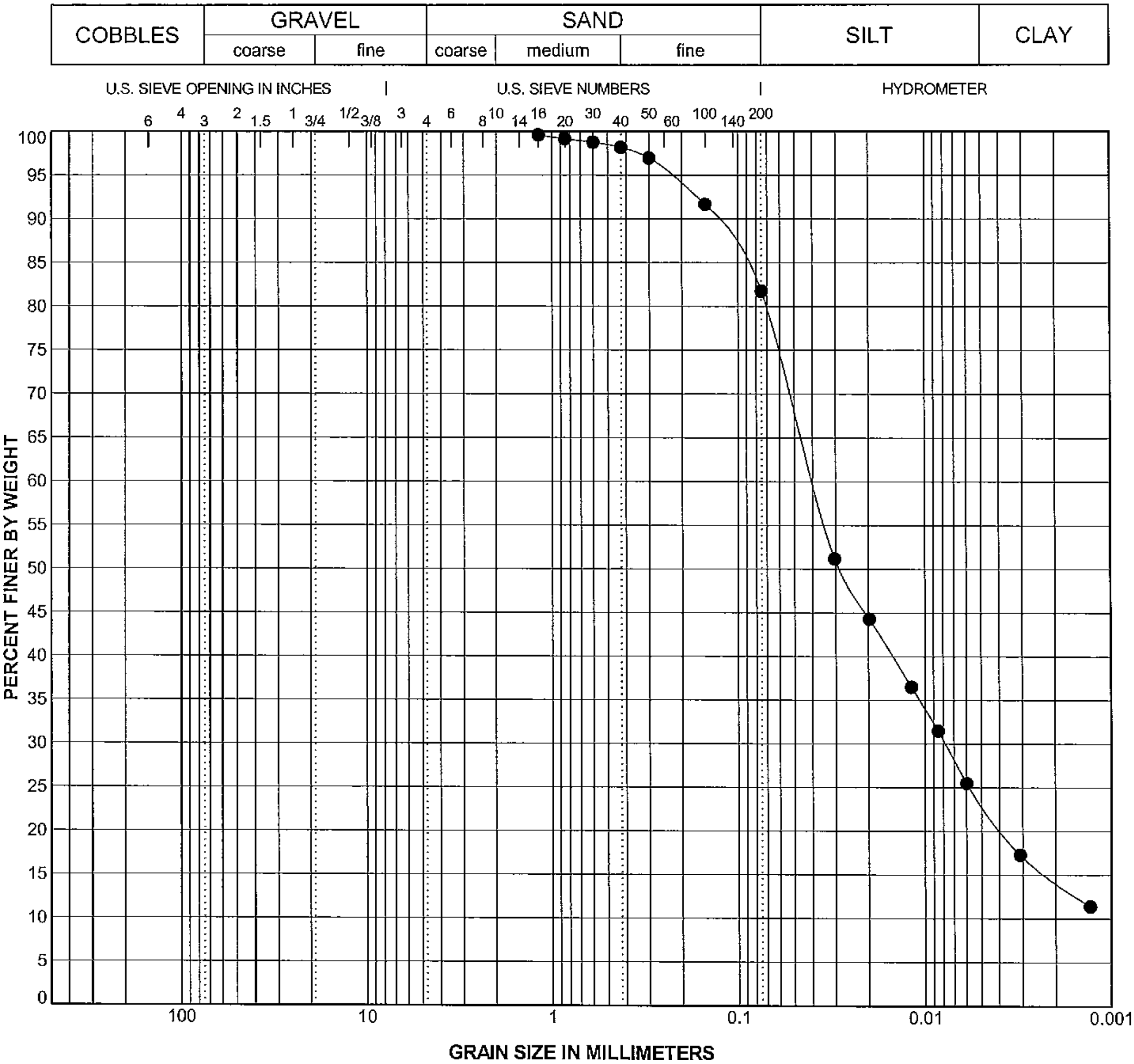
GRAIN SIZE DISTRIBUTION

Project: E.ON U.S. - Pineville Power Station

Project No: 3143-10-1317.03

Checked By: [signature]

MACTEC



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-3C	5.0-7.0	Yellowish brown, silty, lean CLAY	CL	1.18	0.039	0.008			

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

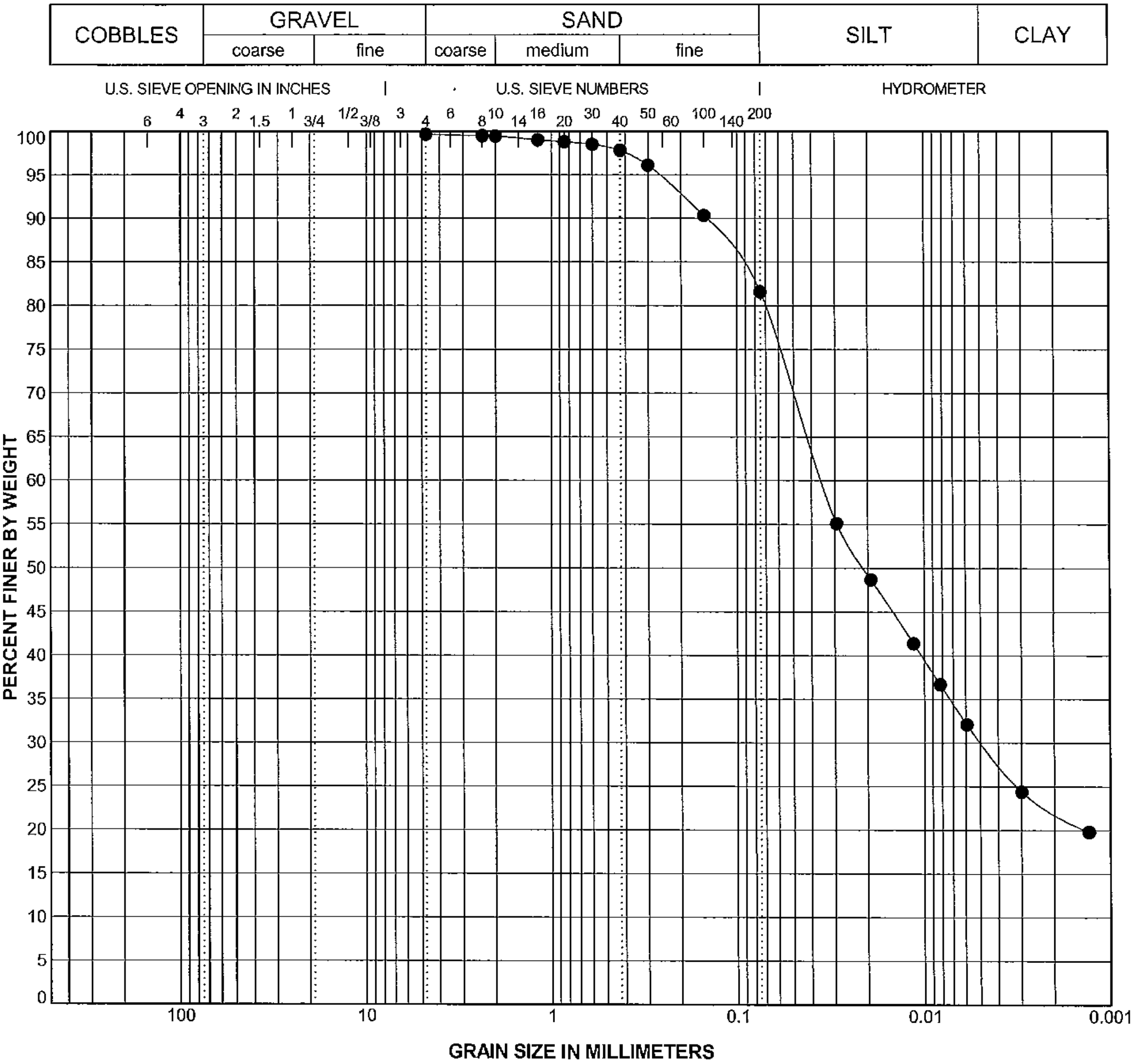
Project: E.ON U.S. - Pineville Power Station

Project No: 3143-10-1317.03

Checked By: [signature]

MACTEC

MACTEC_GRAIN_SIZE 3143101317.03.GPJ LAW_GIBB.GDT 8/25/10



Symbol	Location	Depth, feet	Soil Classification	USCS	D_{100}, mm	D_{60}, mm	D_{30}, mm	D_{10}, mm	C_c	C_u
●	B-3C	16.0-18.0	Dark brown, silty, lean CLAY	CL	4.75	0.035	0.005			

Remarks:

Test Method - ASTM D422

GRAIN SIZE DISTRIBUTION

Project: E.ON U.S. - Pineville Power Station

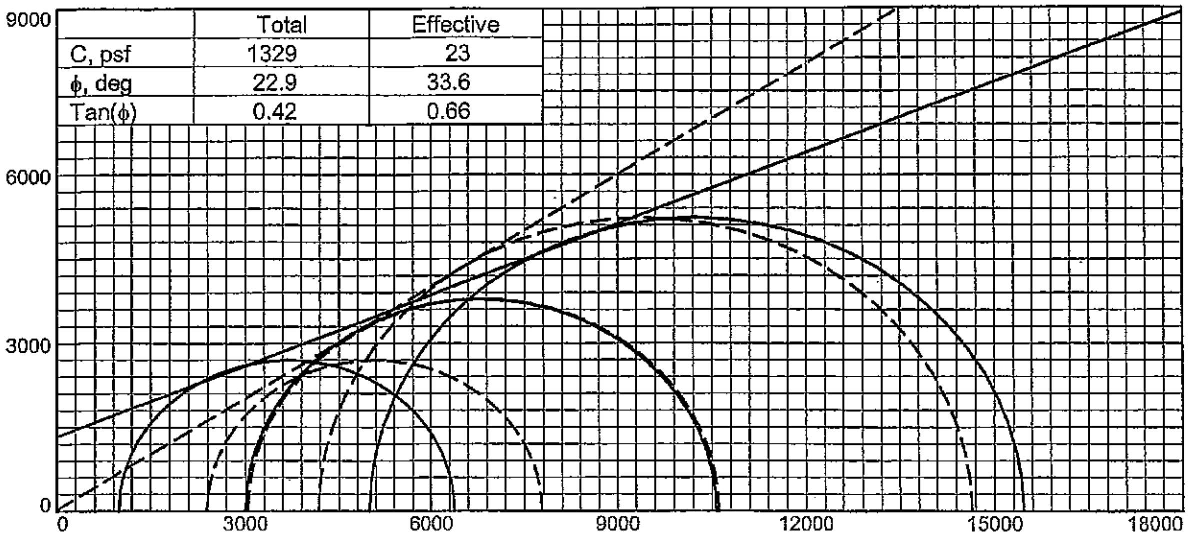
Project No: 3143-10-1317.03

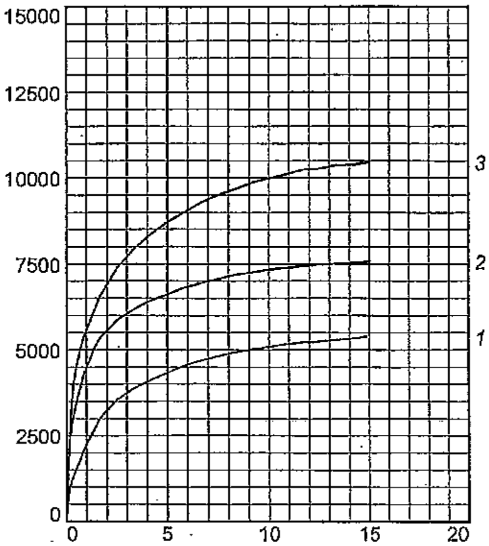
Checked By: AOS

MACTEC

MACTEC_GRAIN_SIZE 3143101317.03.GPJ LAW_GIBB.GDT 8/25/10

TRIAXIAL SHEAR TEST RESULTS





Sample No.		1	2	3
Initial	Water Content, %	23.9	23.6	24.5
	Dry Density, pcf	101.0	101.8	99.8
	Saturation, %	99.5	100.0	98.7
	Void Ratio	0.6372	0.6246	0.6579
	Diameter, in.	2.86	2.87	2.86
	Height, in.	6.10	6.04	6.12
At Test	Water Content, %	24.8	23.6	23.7
	Dry Density, pcf	99.9	101.8	101.7
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6562	0.6246	0.6269
	Diameter, in.	2.89	2.88	2.87
	Height, in.	6.06	5.99	5.99
Strain rate, in./min.		0.01	0.01	0.01
Back Pressure, psf		8640	8640	8640
Cell Pressure, psf		9634	11635	13637
Fail. Stress, psf		5391	7578	10464
Total Pore Pr., psf		7243	8597	9461
Ult. Stress, psf				
Total Pore Pr., psf				
$\bar{\sigma}_1$ Failure, psf		7781	10617	14640
$\bar{\sigma}_3$ Failure, psf		2390	3038	4176

Type of Test:
CU with Pore Pressures
Sample Type: Undisturbed
Description: lean clay with sand

LL= 35 **PL=** 23 **PI=** 12
Assumed Specific Gravity= 2.65
Remarks:

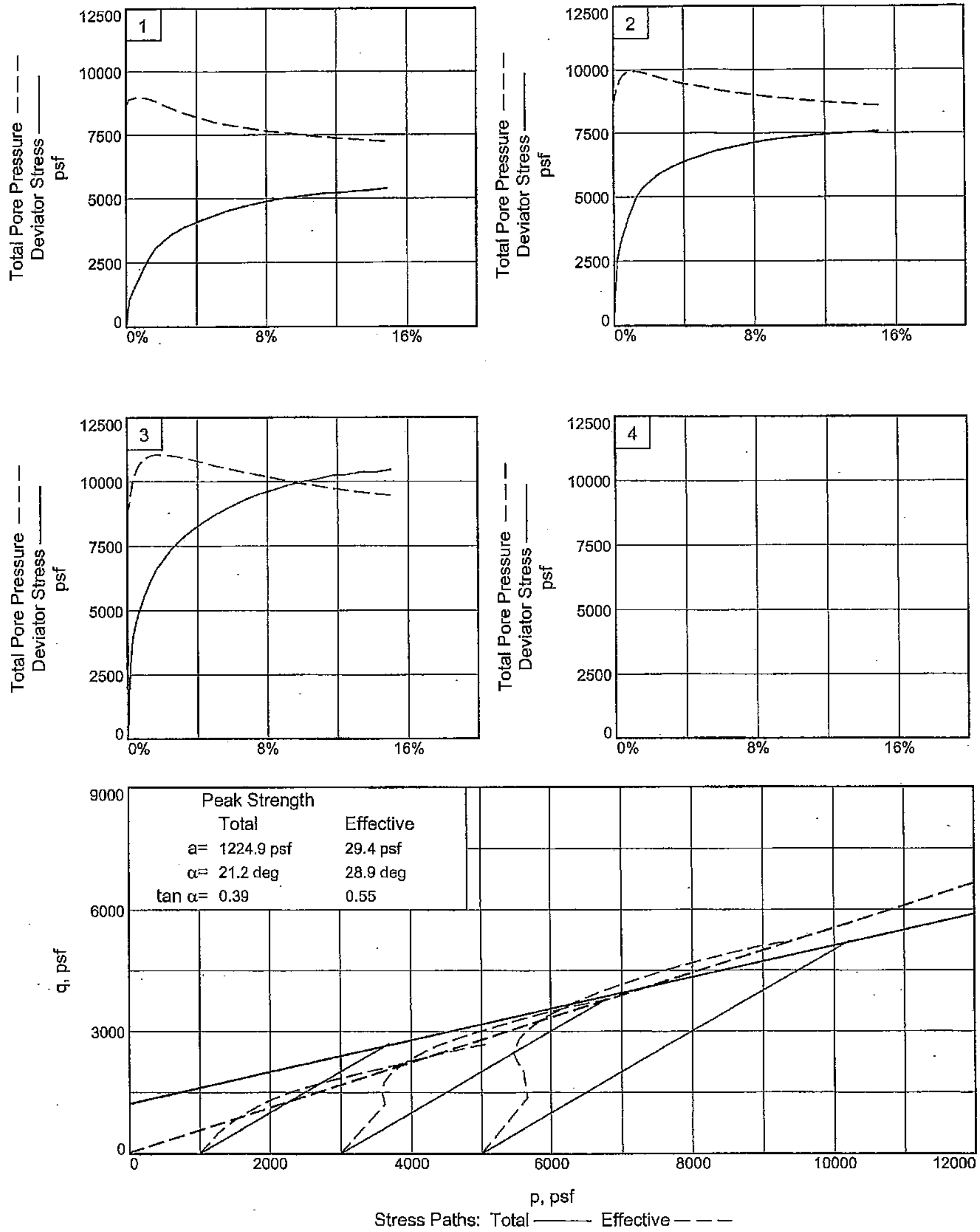
Client: E. ON U.S. Services, Inc.

Project: Pineville Power Station

Location: B-1C
Depth: 12-14
Proj. No.: 314310131703 **Date Sampled:** 8-25-10

TRIAXIAL SHEAR TEST REPORT
MACTEC Engineering and Consulting, Inc.
Charlotte, North Carolina

Tested By: J Alexander **Checked By:** D Kopitsky

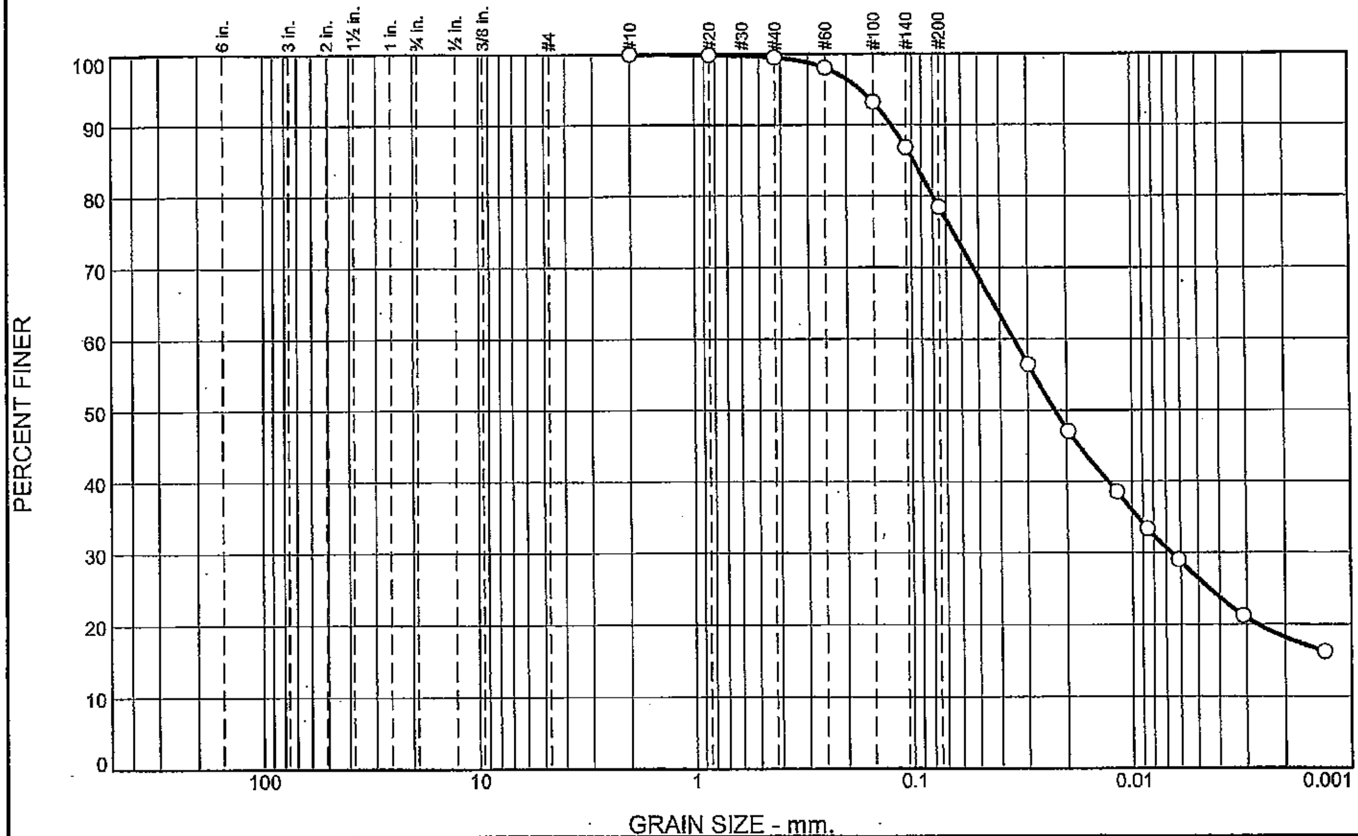


Client: E. ON U.S. Services, Inc.
Project: Pineville Power Station
Location: B-1C **Depth:** 12-14
Project No.: 314310131703

MACTEC Engineering and Consulting, Inc.

Tested By: J Alexander **Checked By:** D Kopitsky

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	21	53	26

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100		
#20	100		
#40	100		
#60	98		
#100	93		
#140	87		
#200	79		

* (no specification provided)

Material Description

lean clay with sand

Atterberg Limits

PL= 23 LL= 35 PI= 12

Coefficients

D_{90}= 0.1238 D_{85}= 0.0978 D_{60}= 0.0347
D_{50}= 0.0226 D_{30}= 0.0066 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

F.M.=0.08

Location: B-1C
Depth: 12-14

Date: 8-25-10

MACTEC Engineering and Consulting, Inc. Charlotte, North Carolina	**Client:** E. ON U.S. Services, Inc. **Project:** Pineville Power Station **Project No:** 314310131703

Tested By: D. Kopitsky **Checked By:** J. Alexander

SUMMARY OF SLOPE STABILITY RESULTS

PCSTABL PLOTS

Pineville Power Station		
3143-10-1317.01		
ALB	Date:	8/30/2010
CRV	Date:	8/30/2010

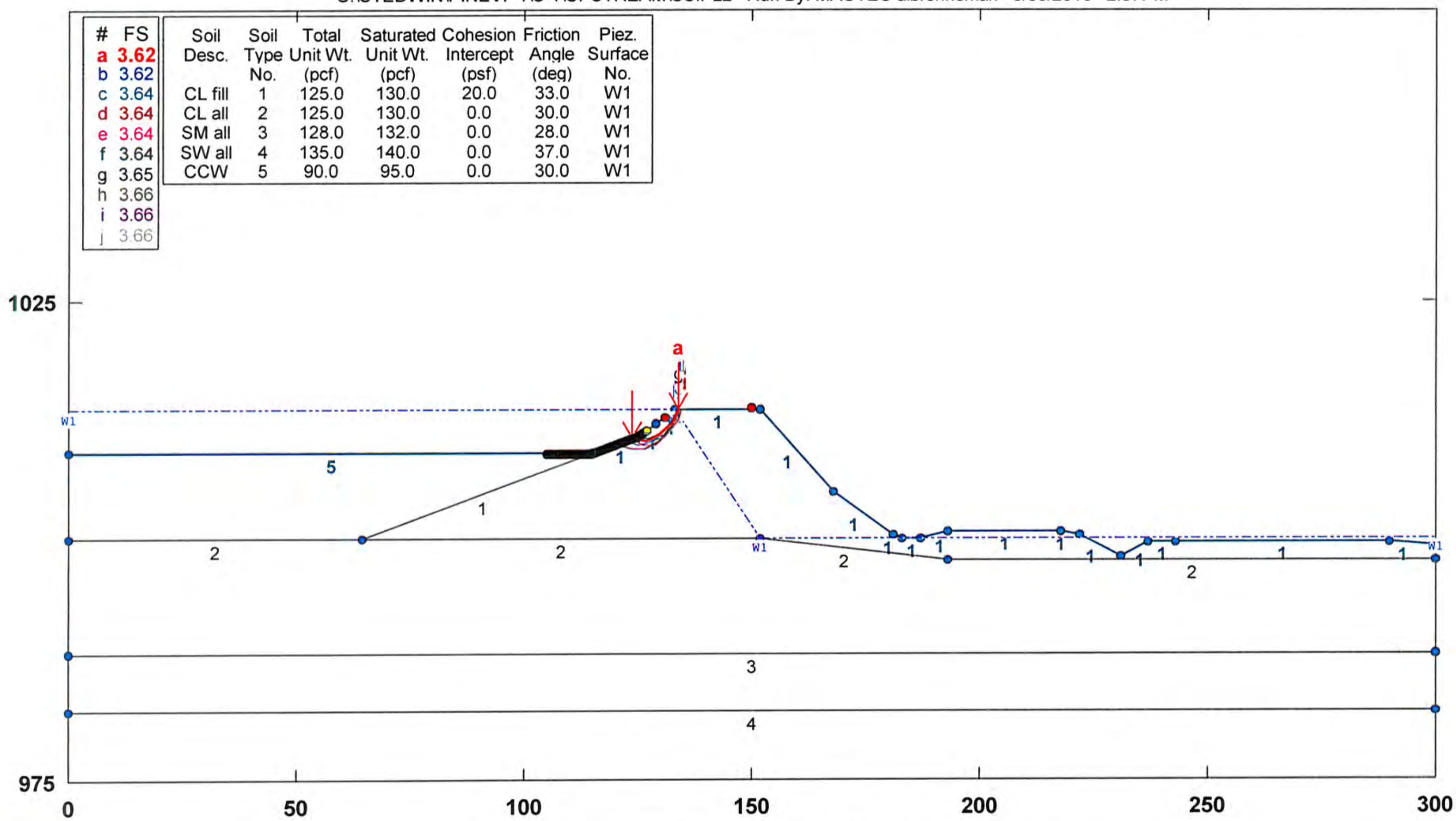
Results of Slope Stability Analyses - Pineville Power Station Ash Pond

Critical Section	Upstream Slope (H:V)	Downstream Slope (H:V)	Long-Term Steady State/Max Surcharge Pool		Rapid Drawdown		Seismic	
			Target FOS*	FOS	Target FOS*	FOS	Target FOS*	FOS
1 Upstream	2.7 : 1.0 3.3 : 1.0 5.6 : 1.0	-	1.5	3.6	1.2	1.8	1.2	1.8
1 Downstream	-	1.8 : 1.0 2.9 : 1.0	1.5	1.6	1.2	1.6	1.2	1 2
2 Upstream	3.9 : 1.0	-	1.5	3.9	1.2	1.9	1.2	1.8
2 Downstream		2.3 : 1.0 3.1 : 1.0	1.5	2.0	1.2	2.0	1.2	1.4
3 Upstream	2.9 : 1.0	-	1.5	4.0	1.2	2.0	1.2	1.6
3 Downstream		4.1 : 1.0	1.5	2.3	1.2	2.3	1.2	1.6

* Target Factor of Safety References: Design Criteria for Dams & Associated Structures (401 KAR 4:030, KAR 4:040)
USACE EM 1110-2-1902: Slope Stability
MSHA Engineering and Design Manual

3143-10-1317 Pineville Power Station Section 1: Upstream - SS/Max Flood

C:\STEDWIN\PINEVI~1\S-1\UPSTREAM\SS.PL2 Run By: MACTEC albrenneman 8/30/2010 2:57PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL fill	1	125.0	130.0	20.0	33.0	W1
CL all	2	125.0	130.0	0.0	30.0	W1
SM all	3	128.0	132.0	0.0	28.0	W1
SW all	4	135.0	140.0	0.0	37.0	W1
CCW	5	90.0	95.0	0.0	30.0	W1

STABL6H FSmin=3.62

Safety Factors Are Calculated By The Modified Bishop Method

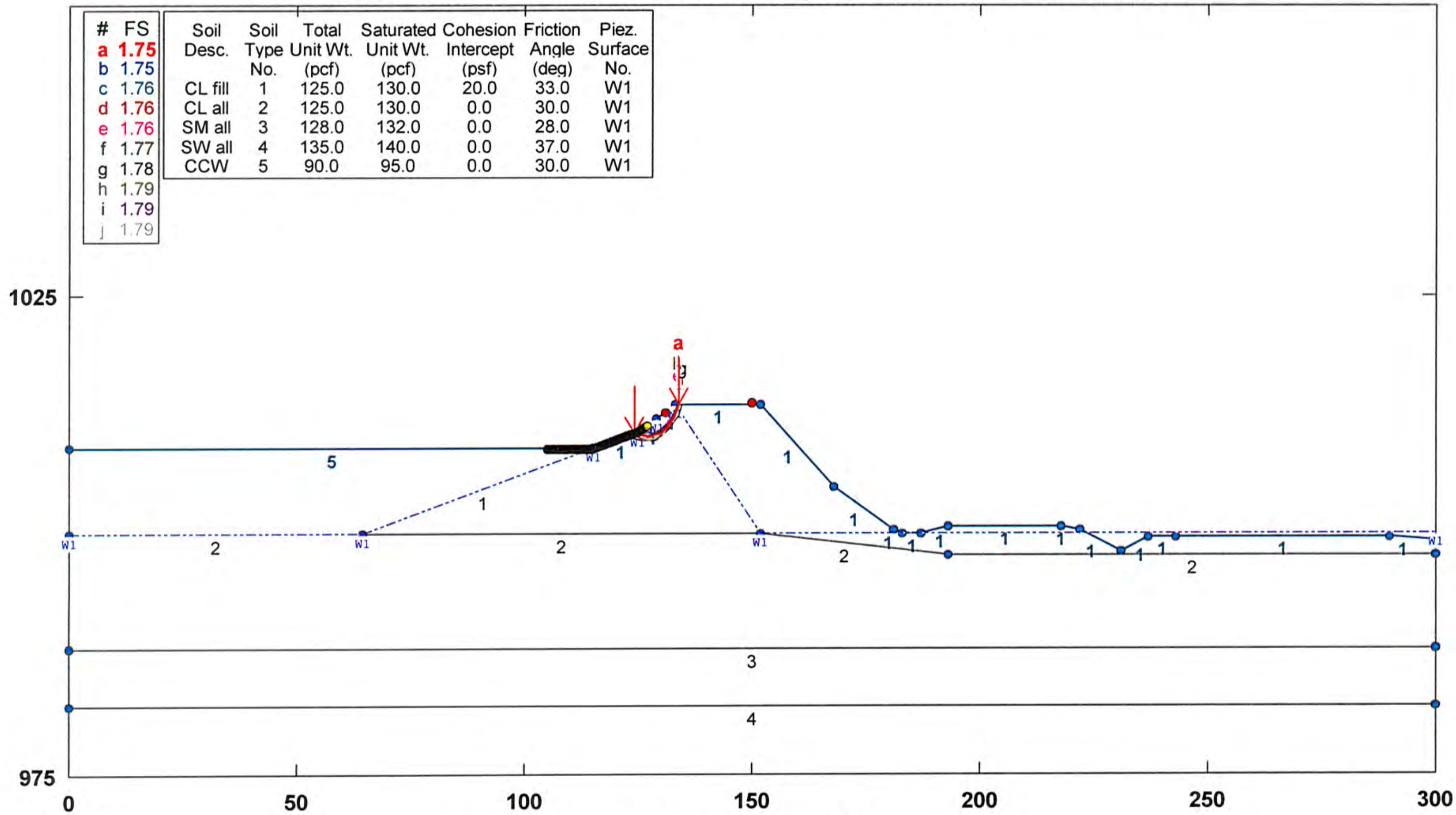
STED

3143-10-1317 Pineville Power Station Section 1: Upstream - Rapid Drawdown

C:\STEDWIN\PINEVI~1\S-1\UPSTREAM\RDD.PL2 Run By: MACTEC albrenneman 8/30/2010 2:59PM

#	FS
a	1.75
b	1.75
c	1.76
d	1.76
e	1.76
f	1.77
g	1.78
h	1.79
i	1.79
j	1.79

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL fill	1	125.0	130.0	20.0	33.0	W1
CL all	2	125.0	130.0	0.0	30.0	W1
SM all	3	128.0	132.0	0.0	28.0	W1
SW all	4	135.0	140.0	0.0	37.0	W1
CCW	5	90.0	95.0	0.0	30.0	W1



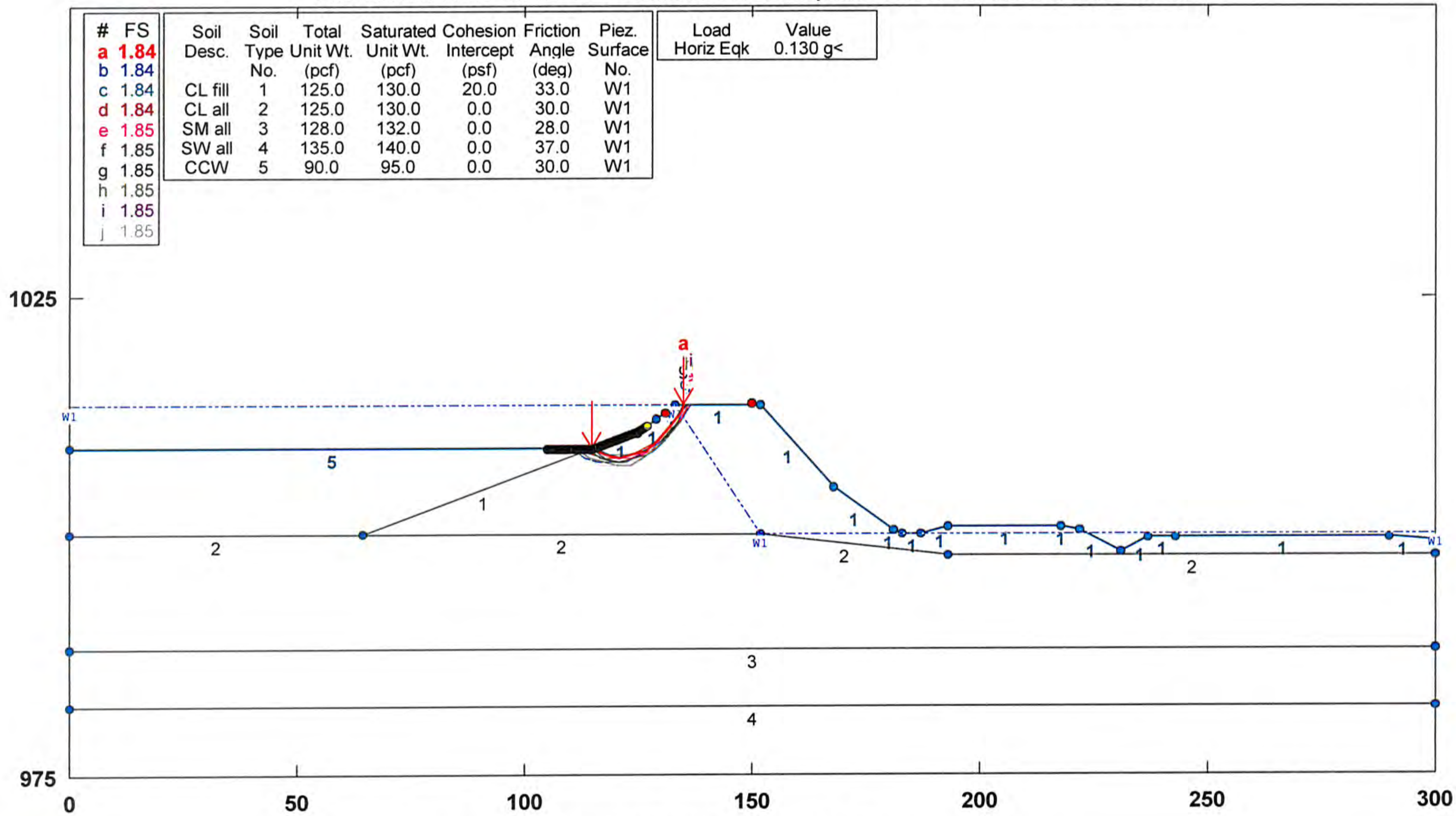
STABL6H FSmin=1.75

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 1: Upstream - Seismic

C:\STEDWIN\PINEVI~1\S-1\UPSTREAM\QUAKE.PL2 Run By: MACTEC albrenneman 8/30/2010 3:08PM



#	FS
a	1.84
b	1.84
c	1.84
d	1.84
e	1.85
f	1.85
g	1.85
h	1.85
i	1.85
j	1.85

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL fill	1	125.0	130.0	20.0	33.0	W1
CL all	2	125.0	130.0	0.0	30.0	W1
SM all	3	128.0	132.0	0.0	28.0	W1
SW all	4	135.0	140.0	0.0	37.0	W1
CCW	5	90.0	95.0	0.0	30.0	W1

Load	Value
Horiz Eqk	0.130 g<

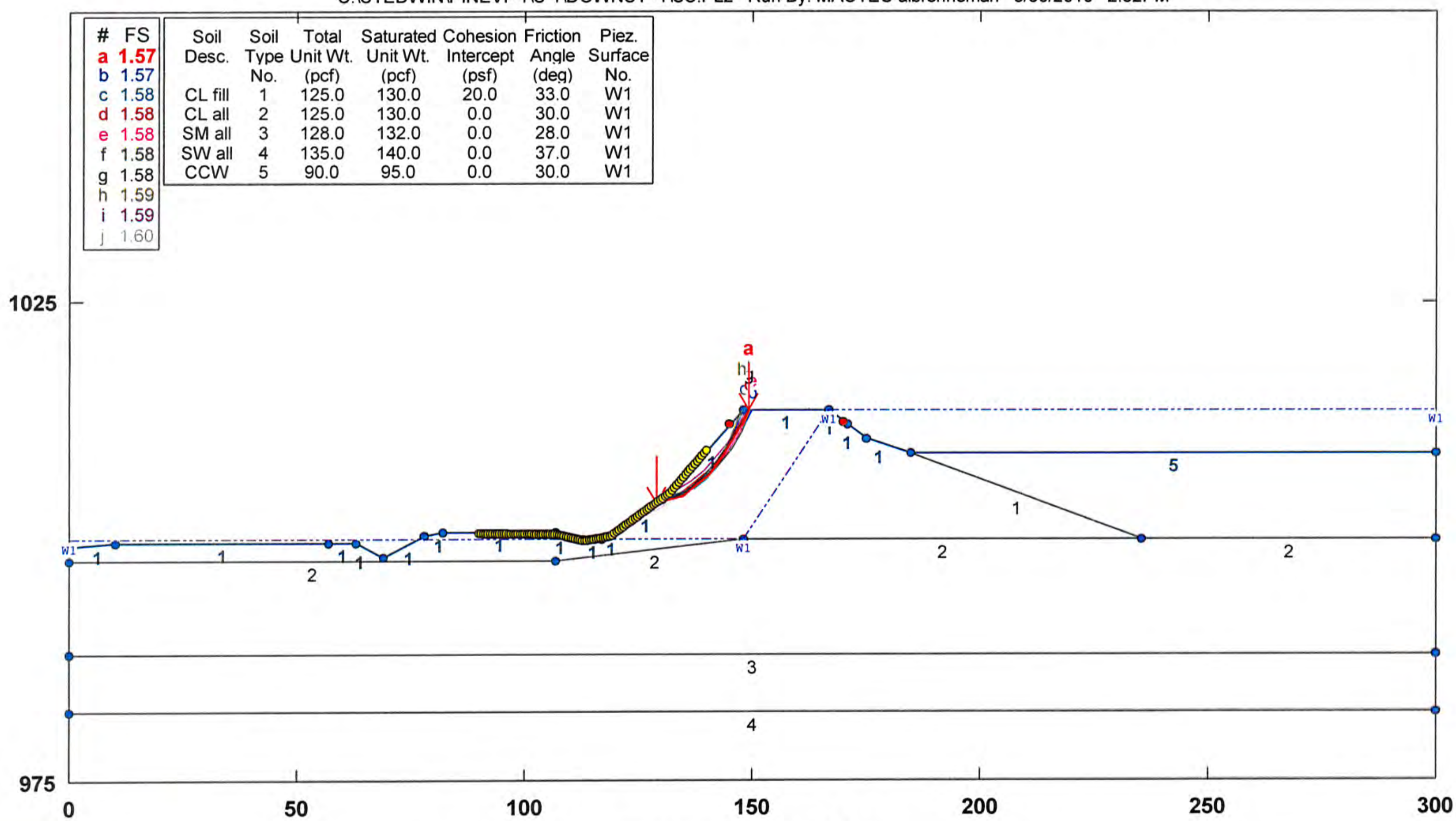
STABL6H FSmin=1.84

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 1: Downstream - SS/Max Flood

C:\STEDWIN\PINEVI~1\S-1\DOWNST~1\SS.PL2 Run By: MACTEC albrenneman 8/30/2010 2:52PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL fill	1	125.0	130.0	20.0	33.0	W1
CL all	2	125.0	130.0	0.0	30.0	W1
SM all	3	128.0	132.0	0.0	28.0	W1
SW all	4	135.0	140.0	0.0	37.0	W1
CCW	5	90.0	95.0	0.0	30.0	W1

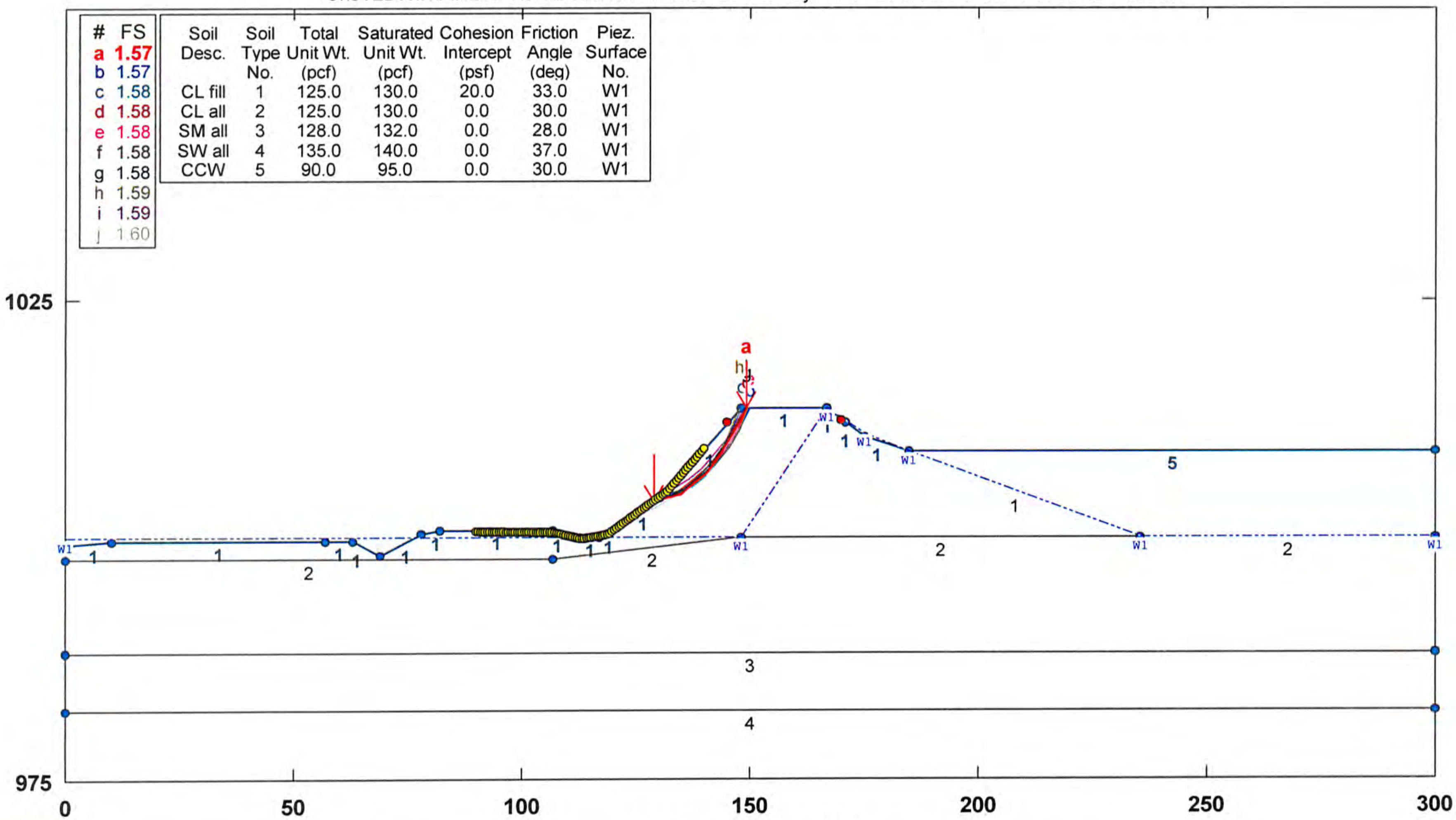
STABL6H FSmin=1.57

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 1: Downstream - Rapid Drawdown

C:\STEDWIN\PINEVI~1\S-1\DOWNST~1\RDD.PL2 Run By: MACTEC albrenneman 8/30/2010 2:55PM



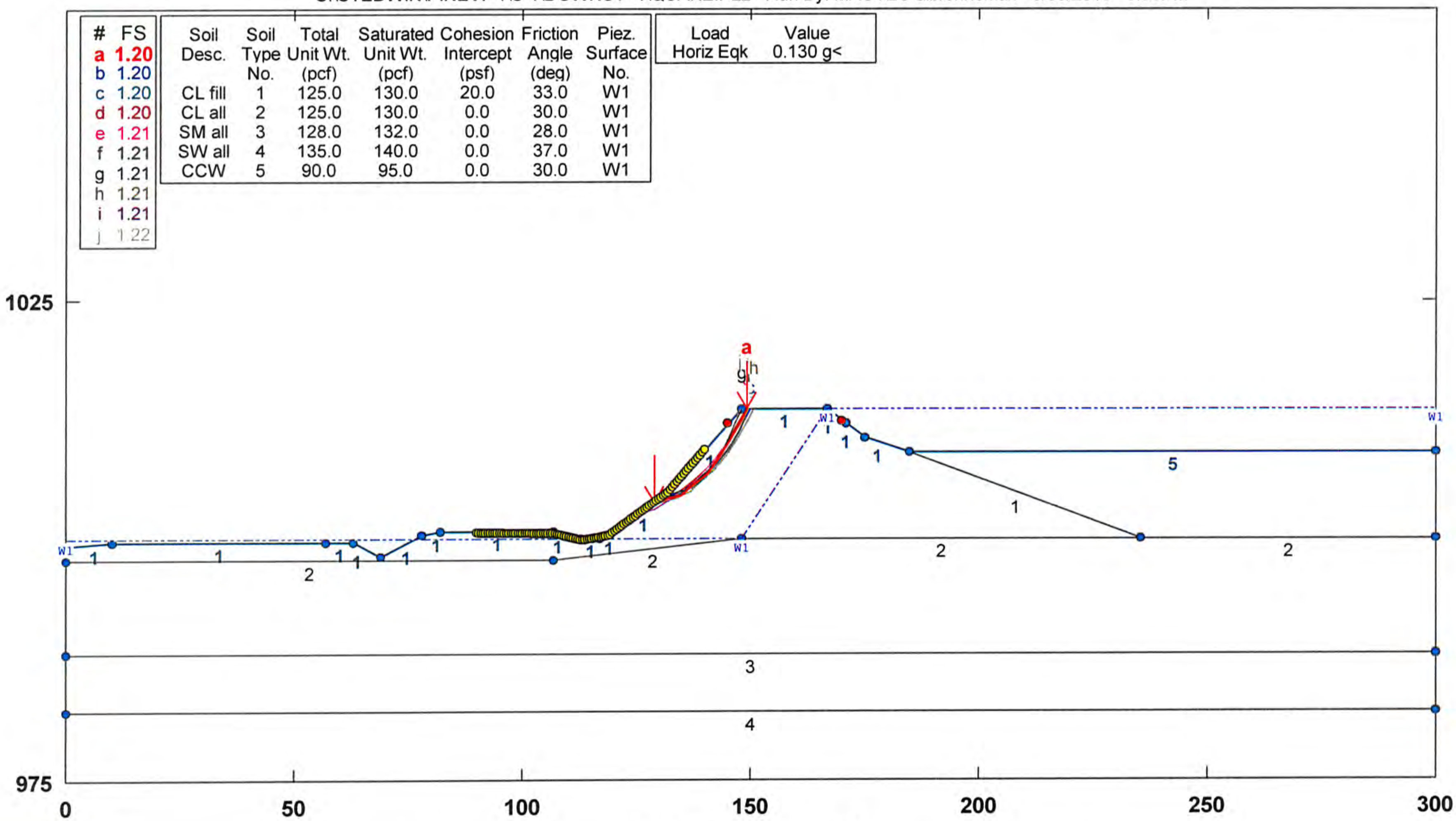
STABL6H FSmin=1.57

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 1: Downstream - Seismic

C:\STEDWIN\PINEVI~1\S-1\DOWNST~1\QUAKE.PL2 Run By: MACTEC albrenneman 8/30/2010 3:06PM



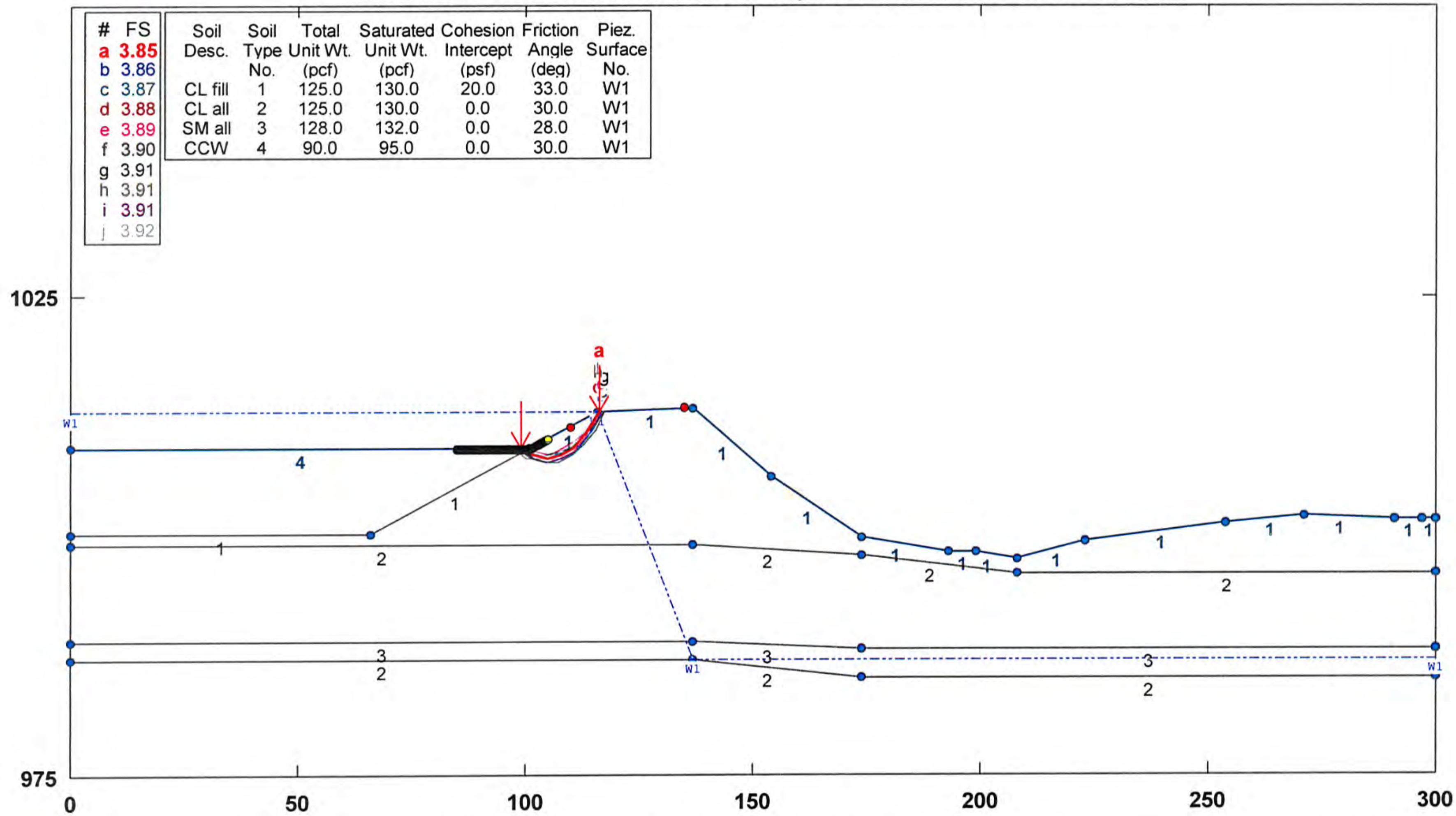
STABL6H FSmin=1.20

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 2: Upstream - SS/Max Flood

C:\STEDWIN\PINEVI~1\S-2\UPSTREAM\SS.PL2 Run By: MACTEC albrenneman 8/30/2010 3:03PM



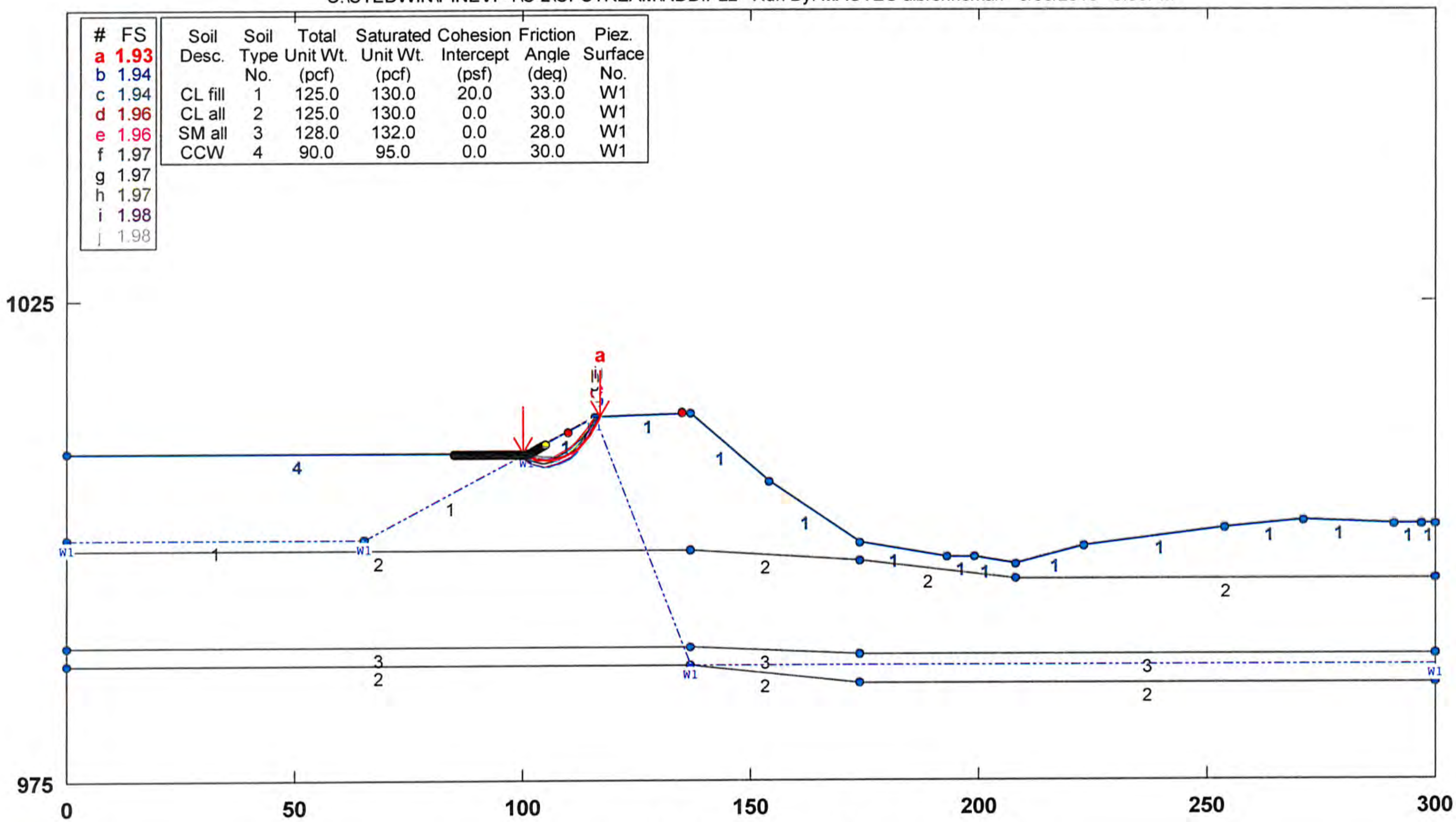
STABL6H FSmin=3.85

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 2: Upstream - Rapid Drawdown

C:\STEDWIN\PINEVI~1\S-2\UPSTREAM\RDD.PL2 Run By: MACTEC albrenneman 8/30/2010 3:06PM



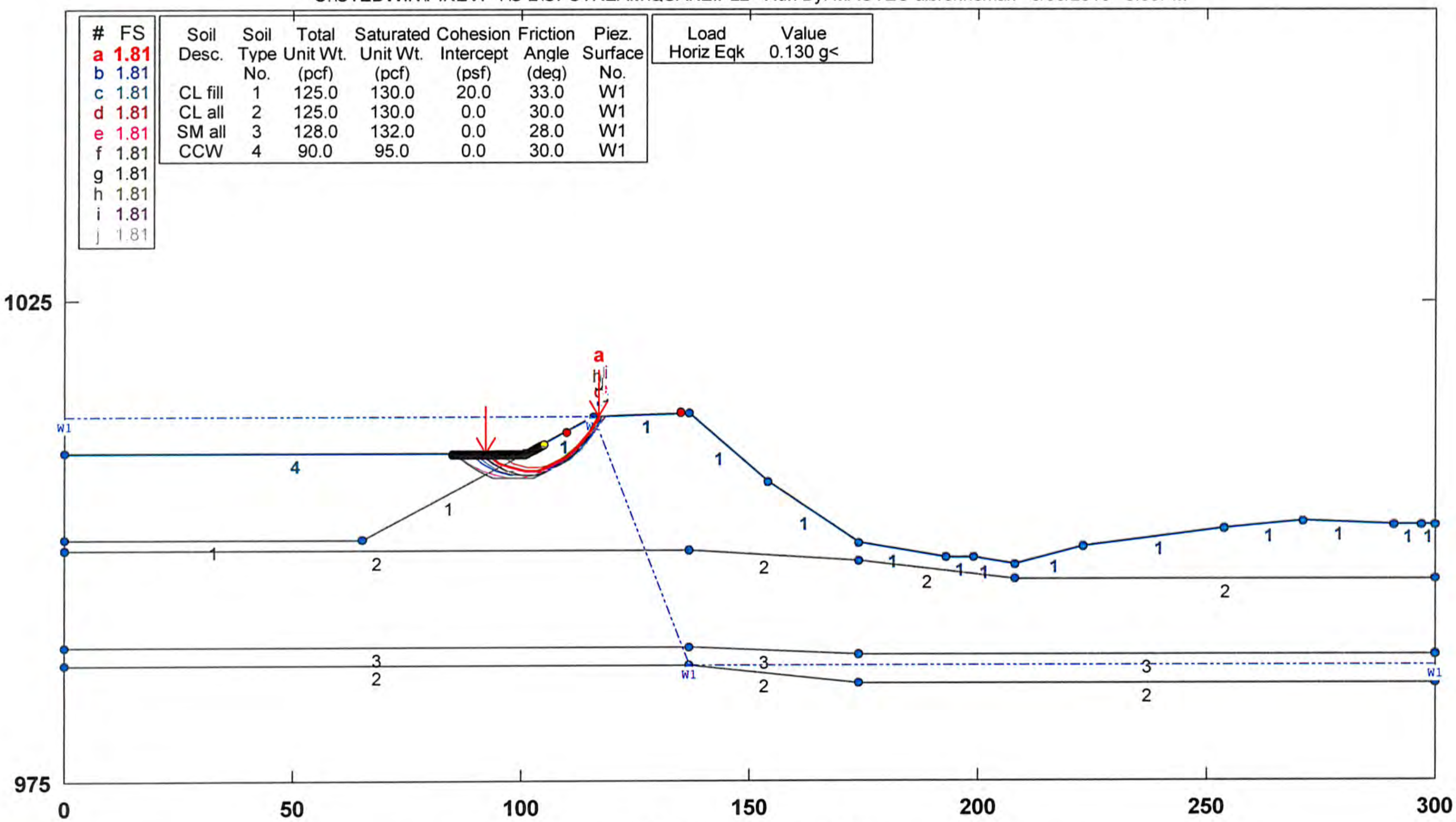
STABL6H FSmin=1.93

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 2: Upstream - Seismic

C:\STEDWIN\PINEVI~1\S-2\UPSTREAM\QUAKE.PL2 Run By: MACTEC albrenneman 8/30/2010 3:09PM



#	FS
a	1.81
b	1.81
c	1.81
d	1.81
e	1.81
f	1.81
g	1.81
h	1.81
i	1.81
j	1.81

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL fill	1	125.0	130.0	20.0	33.0	W1
CL all	2	125.0	130.0	0.0	30.0	W1
SM all	3	128.0	132.0	0.0	28.0	W1
CCW	4	90.0	95.0	0.0	30.0	W1

Load	Value
Horiz Eqk	0.130 g<

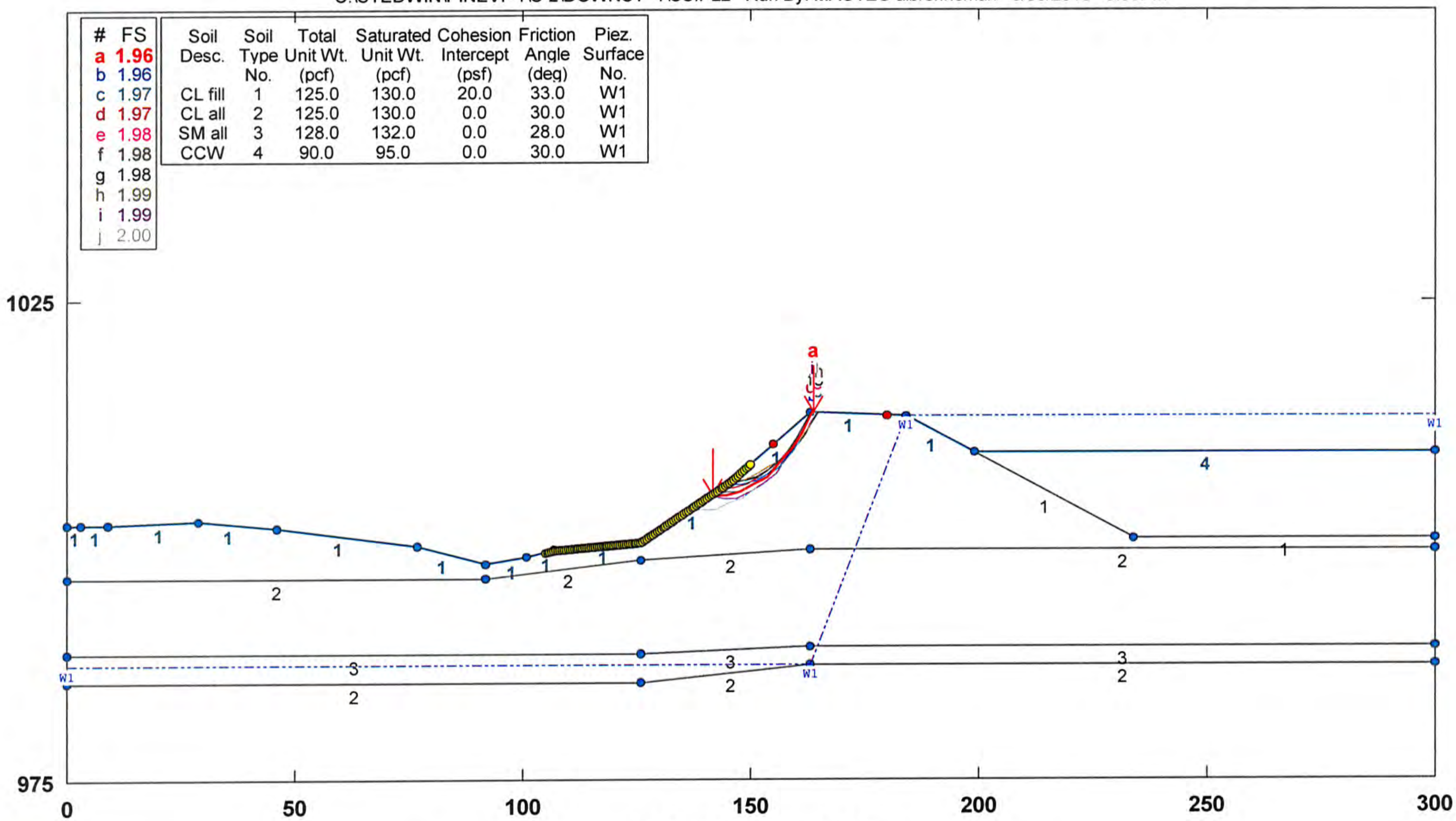
STABL6H FSmin=1.81

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 2: Downstream - SS/Max Flood

C:\STEDWIN\PINEVI~1\S-2\DOWNST~1\SS.PL2 Run By: MACTEC albrenneman 8/30/2010 3:00PM



#	FS
a	1.96
b	1.96
c	1.97
d	1.97
e	1.98
f	1.98
g	1.98
h	1.99
i	1.99
j	2.00

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL fill	1	125.0	130.0	20.0	33.0	W1
CL all	2	125.0	130.0	0.0	30.0	W1
SM all	3	128.0	132.0	0.0	28.0	W1
CCW	4	90.0	95.0	0.0	30.0	W1

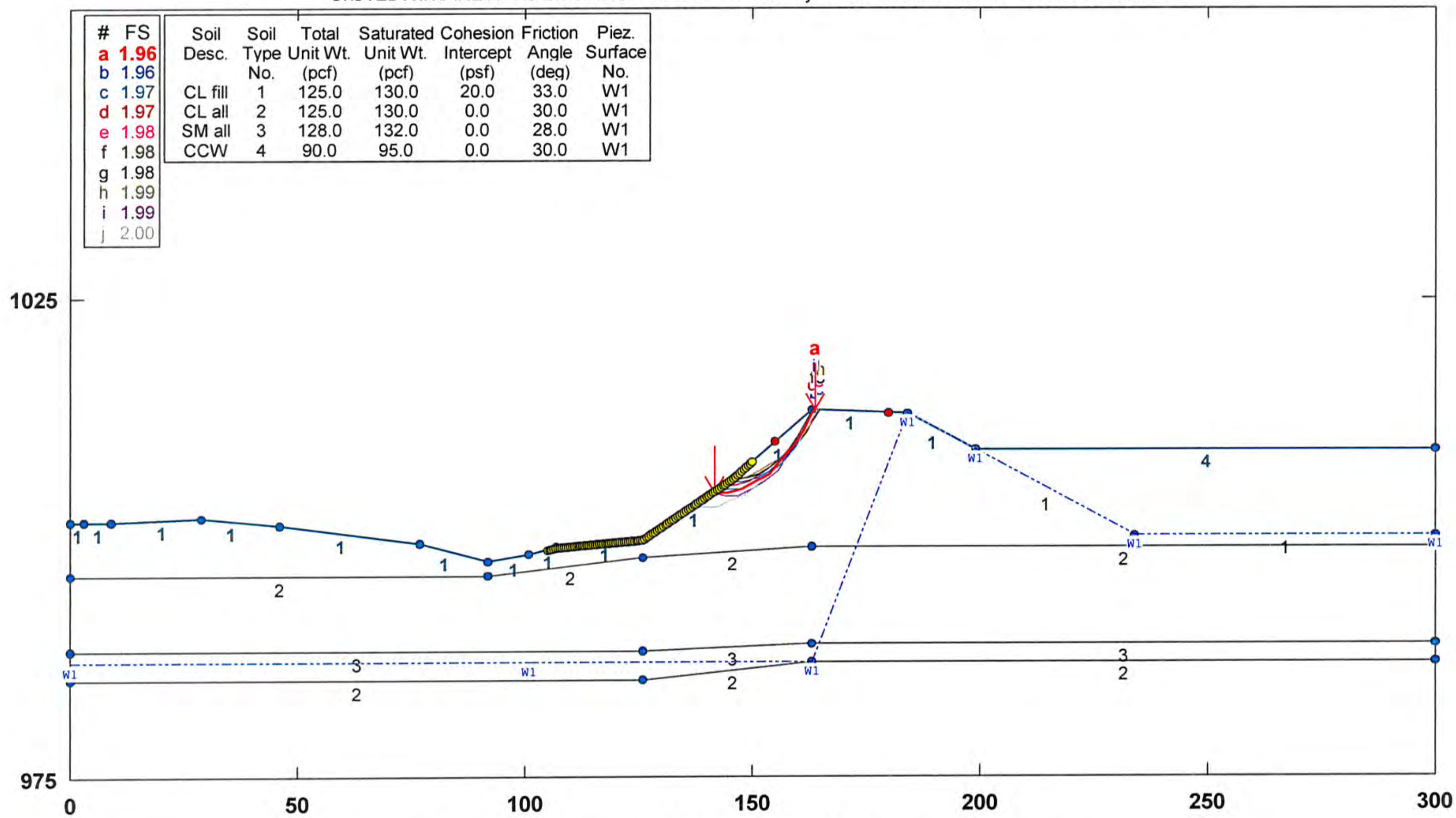
STABL6H FSmin=1.96

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 2: Downstream - Rapid Drawdown

C:\STEDWIN\PINEVI~1\S-2\DOWNST~1\RDD.PL2 Run By: MACTEC albrenneman 8/30/2010 3:02PM



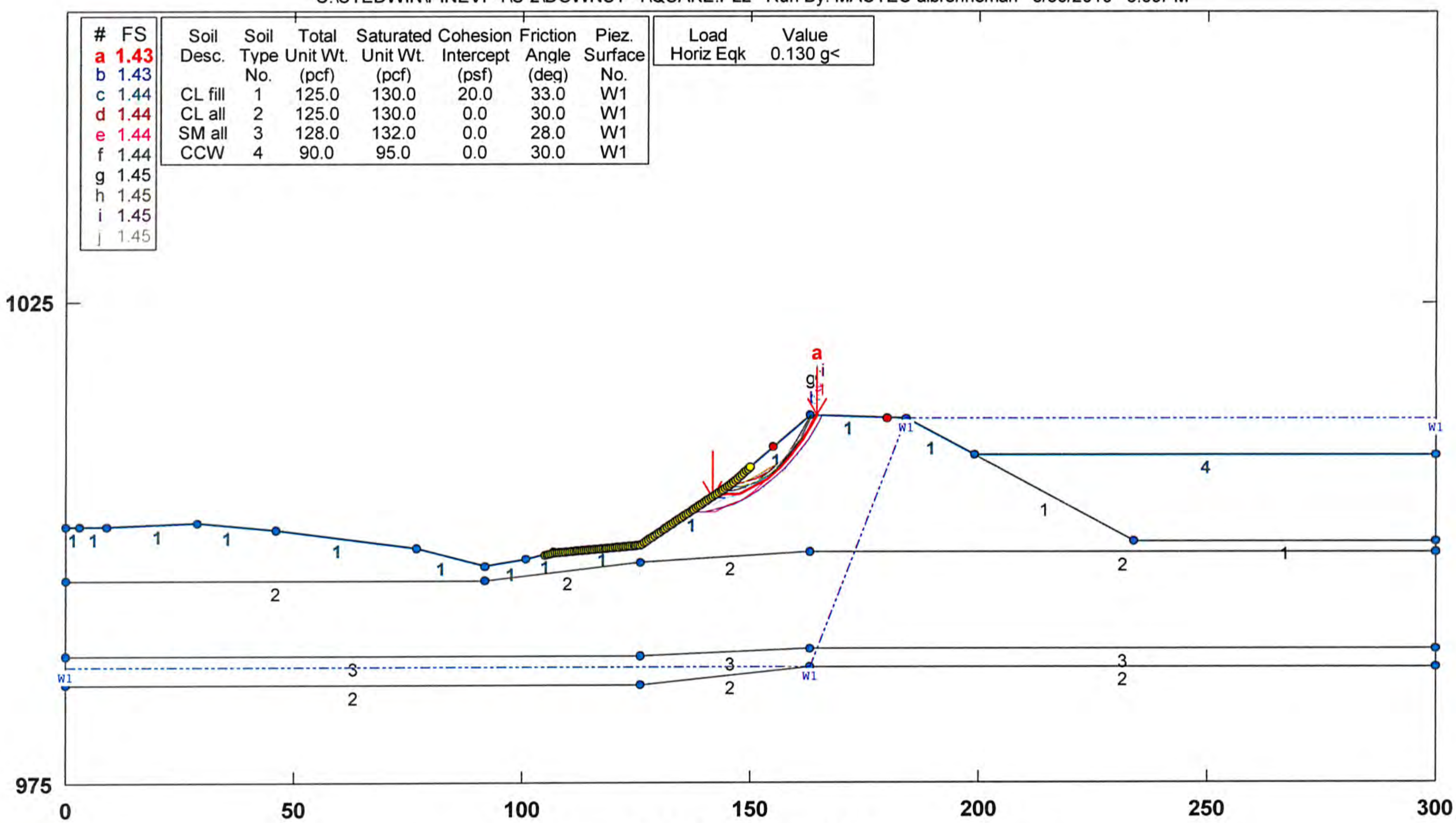
STABL6H FSmin=1.96

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 2: Downstream - Seismic

C:\STEDWIN\PINEVI~1\S-2\DOWNST~1\QUAKE.PL2 Run By: MACTEC albrenneman 8/30/2010 3:09PM



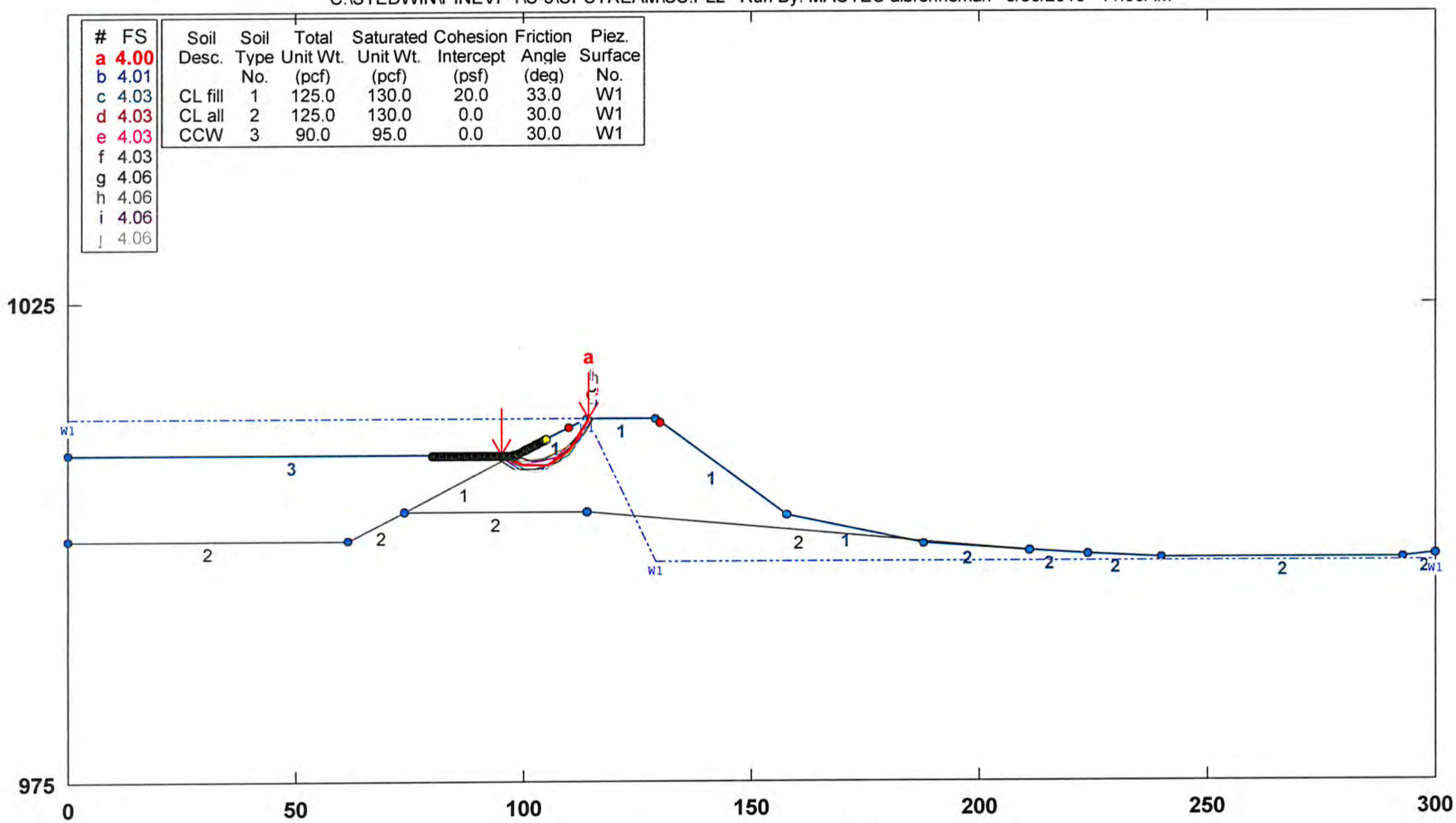
STABL6H FSmin=1.43

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 3: Upstream - SS/Max Flood

C:\STEDWIN\PINEVI~1\S-3\UPSTREAM\SS.PL2 Run By: MACTEC albrenneman 8/30/2010 11:33AM



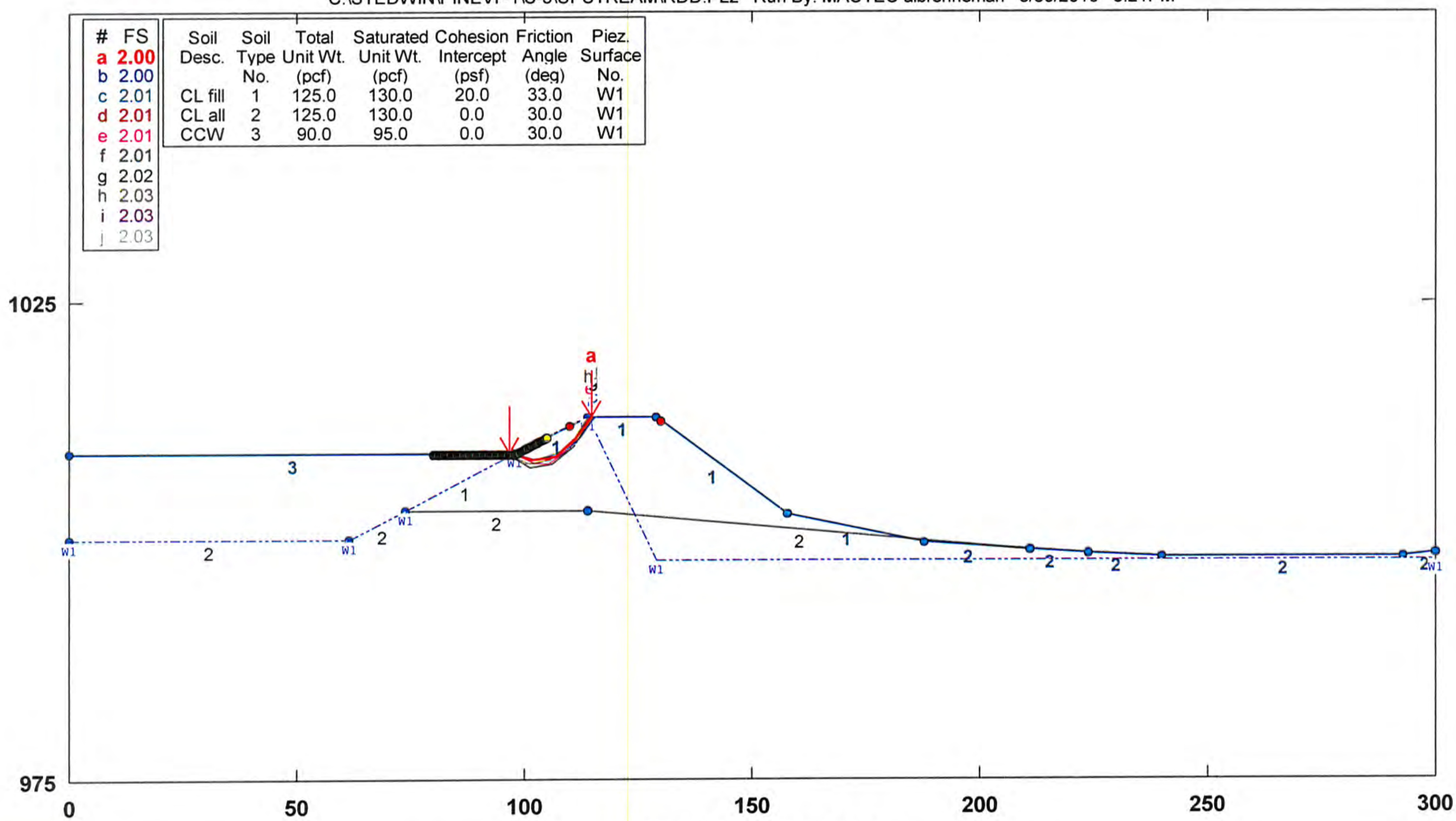
STABL6H FSmin=4.00

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 3: Upstream - Rapid Drawdown

C:\STEDWIN\PINEVI~1\S-3\UPSTREAM\RDD.PL2 Run By: MACTEC albrenneman 8/30/2010 3:21PM



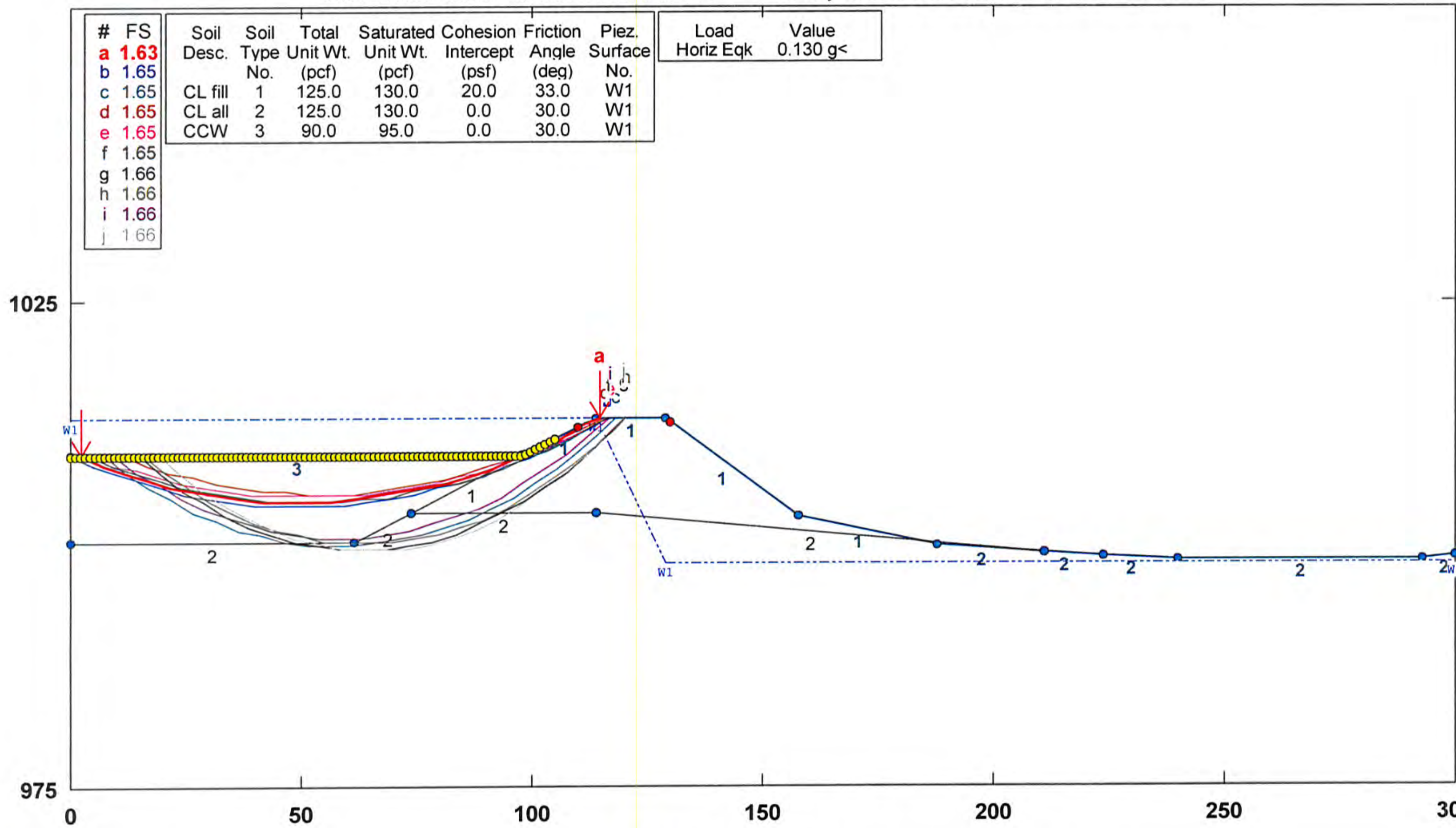
STABL6H FSmin=2.00

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 3: Upstream - Seismic

C:\STEDWIN\PINEVI~1\S-3\UPSTREAM\QUAKE.PL2 Run By: MACTEC albrenneman 8/30/2010 3:13PM



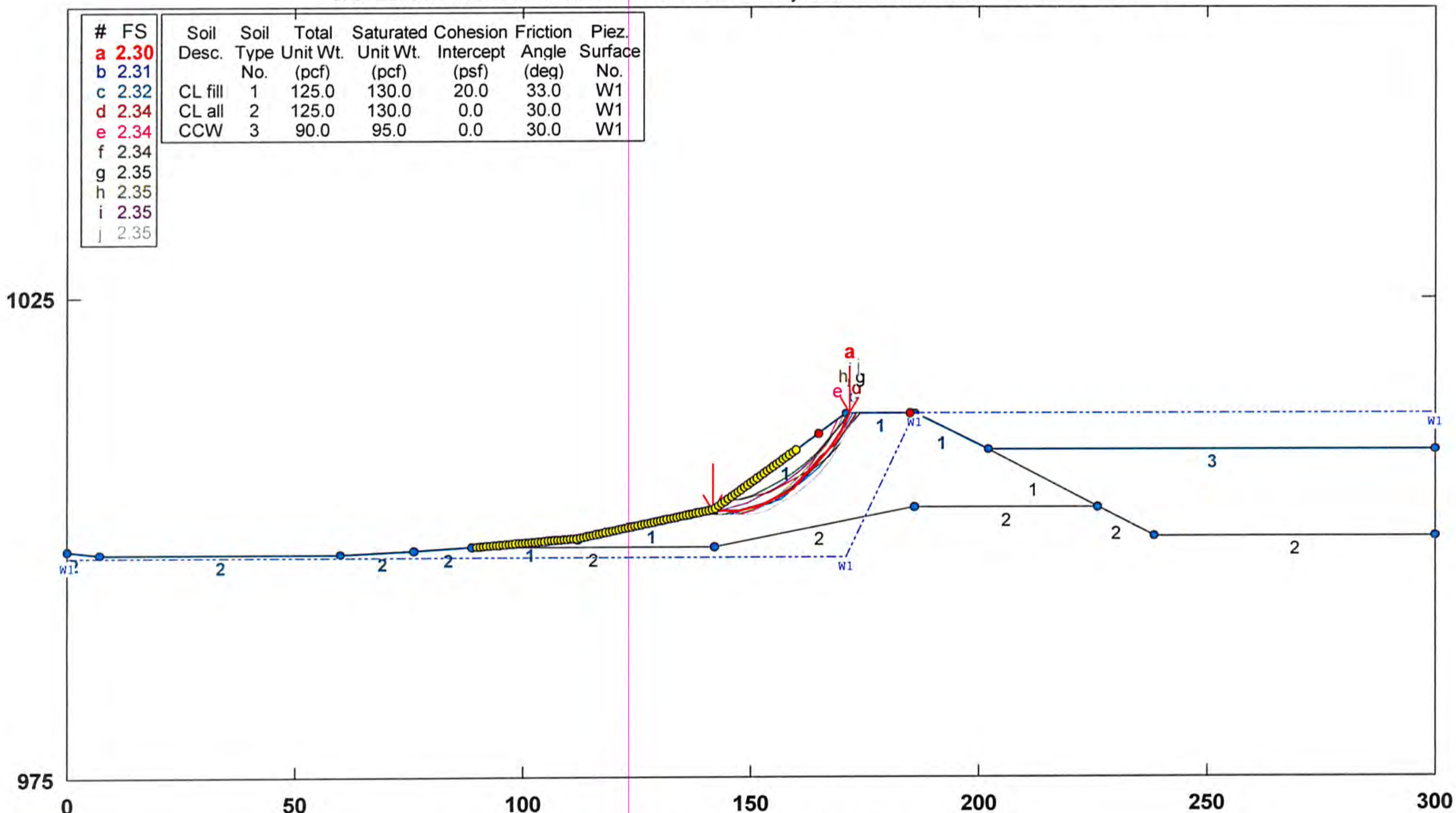
STABL6H FSmin=1.63

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 3: Downstream - SS/Max Flood

C:\STEDWIN\PINEVI~1\S-3\DOWNST~1\SS.PL2 Run By: MACTEC albrenneman 8/30/2010 11:24AM



#	FS
a	2.30
b	2.31
c	2.32
d	2.34
e	2.34
f	2.34
g	2.35
h	2.35
i	2.35
j	2.35

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL fill	1	125.0	130.0	20.0	33.0	W1
CL all	2	125.0	130.0	0.0	30.0	W1
CCW	3	90.0	95.0	0.0	30.0	W1

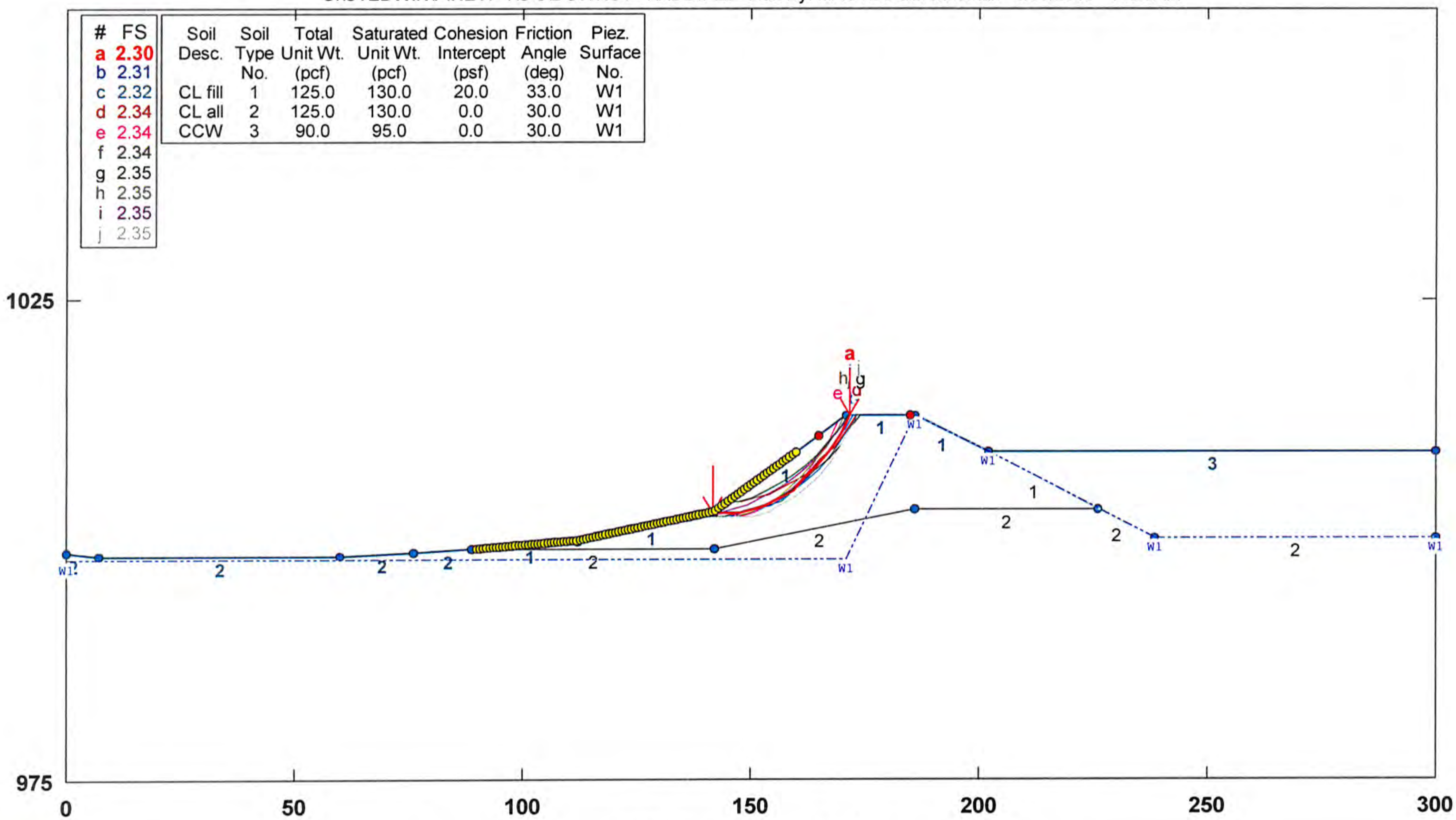
STABL6H FSmin=2.30

Safety Factors Are Calculated By The Modified Bishop Method

STED

3143-10-1317 Pineville Power Station Section 3: Downstream - Rapid Drawdown

C:\STEDWIN\PINEVI~1\S-3\DOWNST~1\RDD.PL2 Run By: MACTEC albrenneman 8/30/2010 11:25AM



STABL6H FSmin=2.30

Safety Factors Are Calculated By The Modified Bishop Method

STED

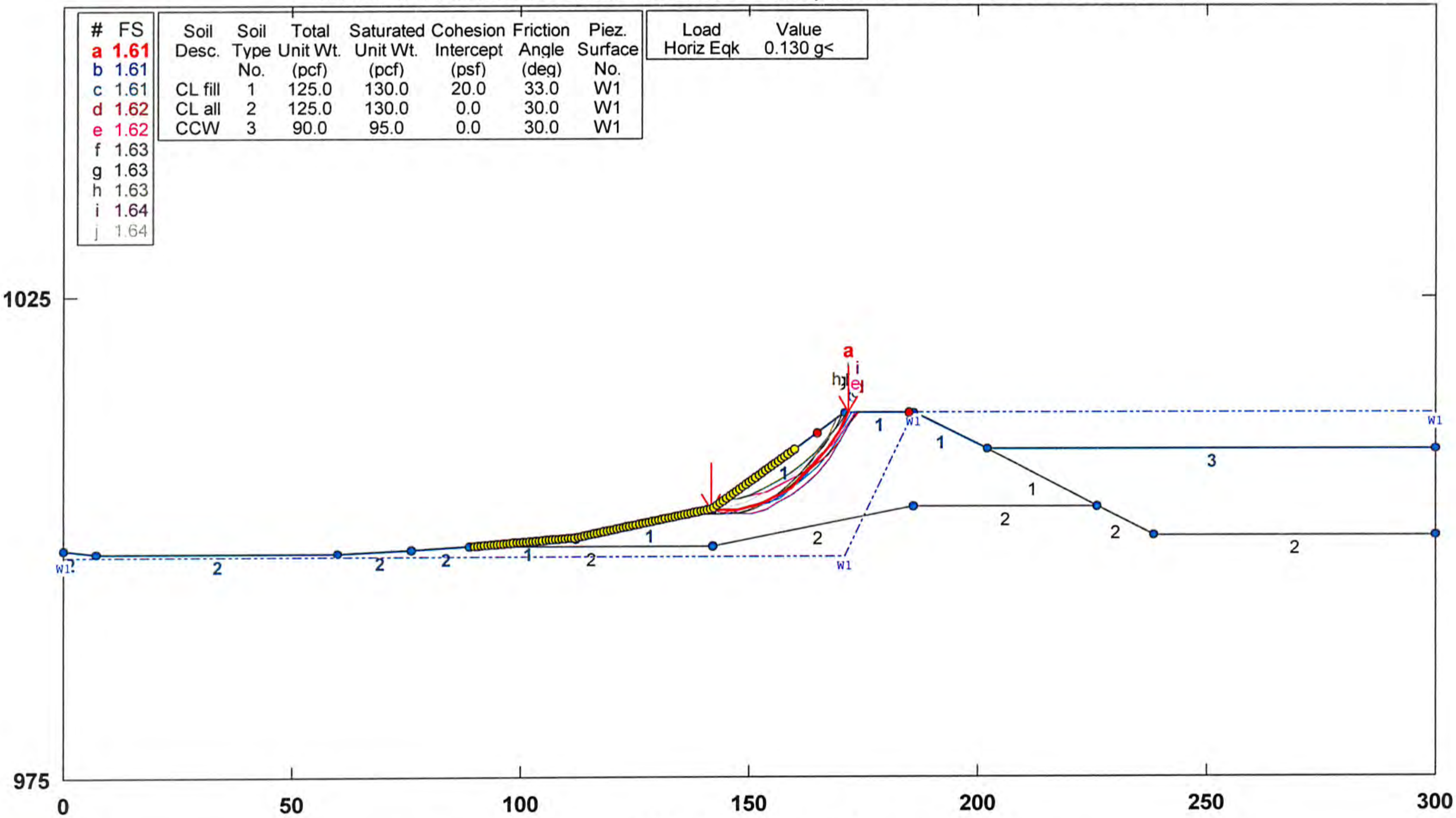
3143-10-1317 Pineville Power Station Section 3: Downstream - Seismic

C:\STEDWIN\PINEVI~1\S-3\DOWNST~1\QUAKE.PL2 Run By: MACTEC albrenneman 8/30/2010 3:10PM

#	FS
a	1.61
b	1.61
c	1.61
d	1.62
e	1.62
f	1.63
g	1.63
h	1.63
i	1.64
j	1.64

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL fill	1	125.0	130.0	20.0	33.0	W1
CL all	2	125.0	130.0	0.0	30.0	W1
CCW	3	90.0	95.0	0.0	30.0	W1

Load	Value
Horiz Eqk	0.130 g<



STABL6H FSmin=1.61

Safety Factors Are Calculated By The Modified Bishop Method

STED

MACTEC

engineering and constructing a better tomorrow

January 19, 2011

Mr. David J. Millay, P.E.
LG&E-KU Services Company, Inc.
220 West Main Street
Louisville, Kentucky 40202
Phone: 502-627-2468
Facsimile: 502-217-2850
Electronic mail: David.Millay@LG&E-KU.com

SUBJECT: Addendum A
Report of Geotechnical Exploration and Slope Stability Analyses
KU Pineville Power Station – Ash Pond
Fourmile, Bell County, Kentucky
MACTEC Project No. 3143-10-1317.03

Dear Mr. Millay:

MACTEC Engineering and Consulting, Inc. (MACTEC) is pleased to submit this Addendum to our *Report of Geotechnical Exploration and Slope Stability Analyses*, dated September 8, 2010. The purpose of this addendum is threefold:

1. Transmit updated piezometer data for the project
2. Transmit a revised stability analyses summary table for the project
3. Provide responses and clarifications to Section 4.2.1, *Geotechnical and Stability Recommendations*, of the USEPA Dam Safety Assessment draft report issued by AMEC in September 2010

A discussion of each of the above items follows. Our services were provided in general accordance with our Master Agreement No. 31528, Contract No. 495429 dated August 23, 2010, and our Proposal No. PROP10LVLE Task 162.

Piezometer Data

Piezometer readings have been taken on two occasions since our referenced report was issued. The attached Table 2 has been revised to include the additional data.

Stability Analyses Summary Table

The attached *Results of Slope Stability Analyses – Pineville Power Station Ash Pond* table has been revised to reflect the target Factor of Safety of 1.0 for dynamic (seismic) loading conditions, per Commonwealth of Kentucky criteria (reference *Design Criteria for Dams & Associated Structures* (401 KAR 4:030, KAR 4:040)).

Response to USEPA Dam Safety Assessment Draft Report, September 2010

AMEC's comments and recommendations in Section 4.2.1 of the referenced Dam Safety Assessment draft report were based, in part, on visual observation of site conditions and review of MACTEC's *Report of Geotechnical Exploration and Slope Stability Analyses* for the Ash Pond at the KU Pineville Power Station in Fourmile, Bell County, Kentucky, dated September 8, 2010. Below is a listing of AMEC's comments and recommendations, each followed by our response or clarification.

1. "In the opinion of the assessing professional engineer, the criteria for minimum safety factors should be in accordance with USACE…as recommended by …MSHA.."

   MACTEC Response: The Pineville Ash Pond is under the jurisdiction of the Kentucky Environment and Energy Cabinet. Therefore, the minimum factors of safety computed during our slope stability analyses were compared to the target factors of safety obtained from Commonwealth of Kentucky documents referenced on Page 4 of our report.

2. "The analysis should consider all critical stages over the life of the pond including pond full conditions."

   MACTEC Response: The Pineville Ash Pond is no longer receiving solids. Therefore, the stability models appropriately reflect critical stages over the life of the pond (i.e., steady-state/maximum flood, rapid drawdown, and dynamic (seismic) loading).

3. "The almost vertical phreatic surfaces shown in the 2010 Stability Analyses is not typically recognized as an acceptable condition."

   MACTEC Response: To optimize the plot field, the STABL6H plots included in our report, which present the geometry, loading conditions, strength parameters, and results for each cross-section analyzed, are not plotted at a natural scale. For this project, there is an exaggeration of approximately 1.75H:1V. This exaggeration causes the phreatic surface to appear steeper than modeled. The phreatic surfaces were modeled based on water level data from piezometers installed in the crest of the embankment, as well as observations of the downstream face and toe of the embankment.

4. "The friction angle value of 30 degrees used for the CCW (ash) in the analysis appears high."

   MACTEC Response: As stated on page 18 of our report, MACTEC has extensive experience with CCW at LG&E-KU facilities in Kentucky and with other similar facilities in the southeastern United States. Laboratory testing (both triaxial and direct shear tests) of CCW from other facilities indicated friction angles of 28 to over 42 degrees. We selected 30 degrees to provide, in our opinion, the appropriate level of conservatism.

5. "Some of the analyses presented appear limited to a circular surface; different types of failure surfaces should be analyzed and optimized."

   MACTEC Response: Circular surface failure is the accepted industry standard and appropriate for this analysis. In addition, Table 6 indicates that the calculated factors of safety are much greater than the minimum required by the Commonwealth of Kentucky

6. "The analyses should include a discussion on how each parameter was derived and data sheets of the computer runs should be included to facilitate review."

   MACTEC Response: Page 18 of our report clearly describes the soil parameter selections. The material input parameters (e.g., total and saturated unit weights, cohesion, and angle of internal friction) used for each loading condition for each cross section analyzed, as well as the horizontal acceleration for seismic loading, where applicable, are presented on the respective STABL6H plots included in our report. The embankment geometry, including material layering and piezometric surface, is presented graphically on the respective STABL6H plots.

We trust the information provided above sufficiently clarifies AMEC's comments related to our *Report of Geotechnical Exploration and Slope Stability Analyses* for the Pineville Ash Pond. We appreciate the continued opportunity to work with you on this project. We look forward to serving as your geotechnical consultant throughout this project. Please contact us if you have any questions regarding the information presented in this letter.

Sincerely,

MACTEC ENGINEERING AND CONSULTING, INC.

Melany L. Brite
Senior Professional

Nicholas G. Schmitt, P.E.
Senior Principal Engineer
Licensed Kentucky 10311

Attachments: Table 2. Summary of Piezometer Readings, Revised 1/19/2011
Results of Slope Stability Analyses – Pineville Power Station Ash Pond, Revised 1/17/2011

Table 2. Summary of Piezometer Readings

Piezometer ID	Date of Installation	Screened Interval Depth (ft)	Top of Ground Elevation (ft) NGVD	Bottom of Piezometer Elevation (ft) NGVD	Date of Reading					
					8/25/10		12/08/10		1/18/11	
					Depth	Elevation	Depth	Elevation	Depth	Elevation
					(ft)					
B-1C	8/13/10	25-35	1013.7	978.7	13.5	1000.2	12.8	1000.9	14.1	999.6
B-3C	8/13/10	15-25	1014.6	989.6	16.4	998.2	15.8	998.8	16.0	998.6

Prepared By: *VM*
Checked By: *ALB*
Revised By: *MLB 1/19/11*
Checked By: *NGS 1/19/2011*

MACTEC

Pineville Power Station	
3143-10-1317.03	
by: ALB	Date: 8/30/2010
checked: CRV	Date: 8/30/2010
revised: MLB	Date: 1/17/2011
checked: NGS	Date: 1/17/2011

Results of Slope Stability Analyses - Pineville Power Station Ash Pond

Critical Section	Upstream Slope (H:V)	Downstream Slope (H:V)	Long-Term Steady State/Max Surcharge Pool		Rapid Drawdown		Seismic	
			Target FOS*	FOS	Target FOS*	FOS	Target FOS*	FOS
1 Upstream	2.7 : 1.0 3.3 : 1.0 5.6 : 1.0	-	1.5	3.6	1.2	1.8	1.0	1.8
1 Downstream	-	1.8 : 1.0 2.9 : 1.0	1.5	1.6	1.2	1.6	1.0	1 2
2 Upstream	3.9 : 1.0	-	1.5	3.9	1.2	1.9	1.0	1.8
2 Downstream		2.3 : 1.0 3.1 : 1.0	1.5	2.0	1.2	2.0	1.0	1.4
3 Upstream	2.9 : 1.0	-	1.5	4.0	1.2	2.0	1.0	1.6
3 Downstream		4.1 : 1.0	1.5	2.3	1.2	2.3	1.0	1.6

* Target Factor of Safety Reference: Design Criteria for Dams & Associated Structures (401 KAR 4:030, KAR 4:040)

Attachment 3

KU Pineville Ash Pond: Hydrologic and Hydraulic Assessment

January 11, 2011
LG&E and KU Services Company

Generation Services

KU Pineville Ash Pond: Hydrologic and Hydraulic Assessment

January 17, 2011

Submitted by:

Reta White, EIT
Civil Engineer
LG&E and KU Services Company

Generation Services

Table of Contents

LG&E KU
PPL companies
Generation Services

KU Pineville Ash Pond: Hydrologic and Hydraulic Assessment

Executive Summary

A hydrologic and hydraulic study of the KU Pineville Ash Pond was performed to evaluate the performance and safety of the pond and its structures during a rainstorm event. It is noted that the ash pond no longer receives coal combustion residuals from the KU Pineville Generating Station. However, it does continue to receive rainwater and groundwater flows from the generating station's basement. Minimum criteria set forth by the Kentucky Division of Water's (KDOW) Engineering Memorandum No. 5 were used to evaluate the study results.

On the basis of that evaluation, it was determined that the KU Pineville Ash Pond meets KDOW's minimum criteria and performs sufficiently. Further, the ash pond can effectively operate at or below a pool elevation of 1,011 ft and continue to maintain a minimum freeboard of 1.5 feet or more.

The southwest corner of the ash pond is the lowest point along the pond's embankment. In order to create a more uniform embankment height and keep a freeboard of approximately 2.0 feet, it is recommended that the southwest embankment corner of the pond be raised to an elevation of 1,014 ft.

1.0 Introduction and Site Description

1.1 Introduction

The following hydrologic and hydraulic analysis was developed to assess the performance of the Principal Spillway Structure for the Kentucky Utilities (KU) Pineville Generating Station Ash Pond. The site is located in Bell County, Kentucky, approximately five miles northwest of the city of Pineville, Kentucky. A project location map is located in Appendix A.

1.2 Site Description

The Pineville Ash Pond was constructed in 1977 to manage coal combustion residuals (CCRs), including fly ash and bottom ash produced through the coal combustion process at the power generating station. The KU Pineville Generating Station was retired in December 2001, and no longer generates electricity. Since that time the Ash Pond no longer receives CCR from the station. However, the Ash Pond does receive water flow from sump pumps located within the station's boiler-turbine building basement. This flow originates from rainfall runoff and groundwater infiltration. The sump pumps discharge through an 18-inch corrugated metal pipe (CMP) which outlets to the northwest corner of the ash pond. Area A1 of the drainage area map located in Appendix A encompasses the basin that drains to the station's sump pumps.

The Pineville Ash Pond has a side-hill configuration with earth embankments at the south and west limits. The embankments have a minimum crest elevation of approximately 1,014 North American Vertical Datum of 1988 (NAVD88). The drainage area map in Appendix A delineates the ash pond's drainage basin (area A2) and shows the topography of the site.

The principal spillway of the pond consists of a concrete riser box structure connected to a 15-inch corrugated metal pipe (CMP) set at a one percent slope (See Appendix B). The riser supports an adjustable skimmer and stop log unit which enables operators to adjust the water level and discharge rate of the structure. The 15-inch CMP discharges at the downstream toe of the embankment through a permitted discharge point to a rip-rap lined channel which conveys flows to the Cumberland River.

2.0 Methodology and Results

2.1 Methodology

Site topographic data developed by L.R. Kimball and Associates in January, 2010 was used to delineate the ash pond's watershed and create a stage-storage curve. Characteristics of the Pineville Ash Pond basin are summarized in Table 1. The water flow from the generating station's basement sump pumps was modeled as baseflow.

Table 1. Pineville Ash Pond Basin Characteristics

Total Drainage Area (Acres)	Composite Curve Number	Time of Concentration (Minutes)	Baseflow (cfs)
13.49	84	18	0.76

A stage-discharge curve of the principal spillway structure was developed from original design drawings. These design drawings are located in Appendix B. All elevations noted in the design drawings reference the National Geodetic Vertical Datum of 1929 (NGVD29) and required a conversion to NAVD88 to be used in the analysis. The stage-discharge curve was calculated based on weir flow, orifice flow or pipe flow. Figures 1 and 2 show the stage-storage and stage-discharge curves respectively.

Figure 1. Pineville Ash Pond Stage-Storage Curve

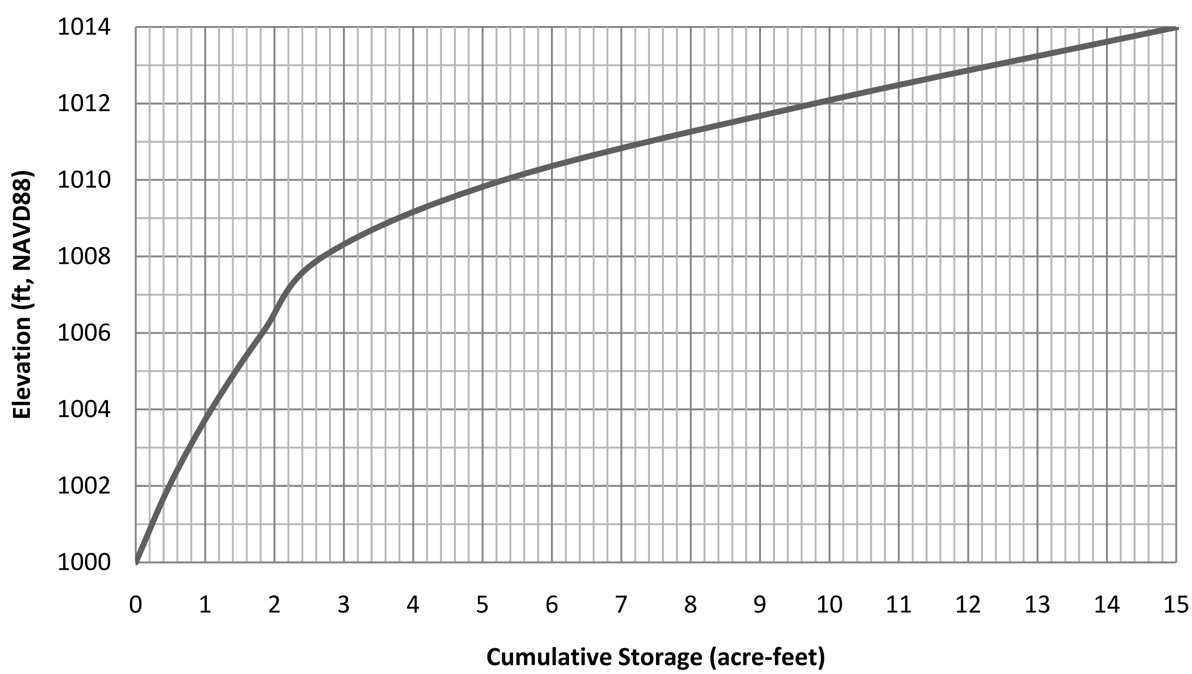
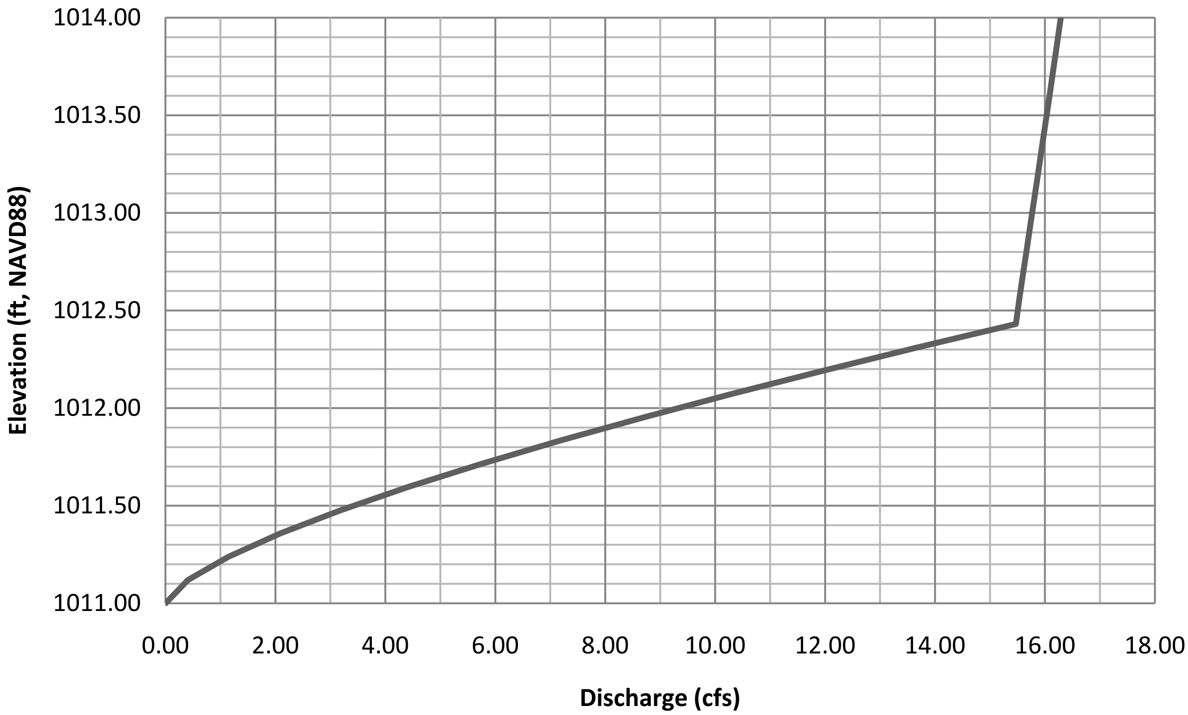


Figure 2. Pineville Ash Pond Stage-Discharge Curve



Pineville Ash Pond is too small to qualify as a dam according to regulations published by the Kentucky Department for Natural Resources and Environmental Protection's (KDEP) Division of Water (KDOW). However, for the purposes of this evaluation, hydrologic modeling was based on minimum hydrologic and hydraulic design criteria for a Class (A) Low Hazard Dam as set forth in KDOW's Engineering Memorandum No. 5. Precipitation values were obtained from KDOW Engineering Memorandum No. 2, "Rainfall Frequency Values for Kentucky." Storm criteria used for this analysis are outlined in Table 2.

Table 2. Summary of Hydrologic Criteria

Hydrograph	Frequency	Duration	Precipitation (inches)
Principal Spillway	100-Year	24-Hour	6.3
Emergency Spillway	100-Year	6-Hour	4.7
Freeboard	100-Year	6-Hour	7.6*

*Calculated according to KDOW Memo No.5 Class (A) dam criteria.

Although the Pineville Ash Pond does not have an emergency spillway, an emergency spillway hydrograph was developed in order to evaluate the performance of the principal spillway structure. It is understood that KDOW has historically permitted structures with relatively small watersheds to operate without an emergency spillway if the principal spillway can adequately pass the emergency spillway hydrograph without overtopping the pond. The freeboard hydrograph precipitation was calculated according to the following equation provided for a Class (A) dam in KDOW's Memorandum No. 5:

$$\boldsymbol{P_A = P_{100} + 0.12 \times (PMP - P_{100})}$$

P_A: Freeboard Hydrograph Precipitation
P_{100} : 6-hour, 100-year precipitation

All design parameter calculations were based on hydrologic design procedures contained in the NRCS National Engineering Handbook, Section 4 "Hydrology" (NEH-4).

2.2 Results

The HEC-HMS 3.5 program developed by the United States Army Corps of Engineers (USACE) was used to analyze the Pineville Ash Pond site. Table 3 shows a summary of the modeling results. See Appendix C for complete HEC-HMS analyses output.

Table 3. Summary of HEC-HMS 3.5 Analysis

	Principal Spillway Hydrograph	Emergency Spillway Hydrograph	Freeboard Hydrograph
Pool Elevation (feet)*	1,011	1,011	1,011
Peak Inflow (cfs)	71.2	33.9	63.4
Peak Outflow (cfs)	10.1	7.3	12.4
Peak Elevation (feet)*	1012.1	1011.8	1012.4
Freeboard (feet)	1.9	2.2	1.6

*Elevations listed reference NAVD88.

3.0 Recommendations

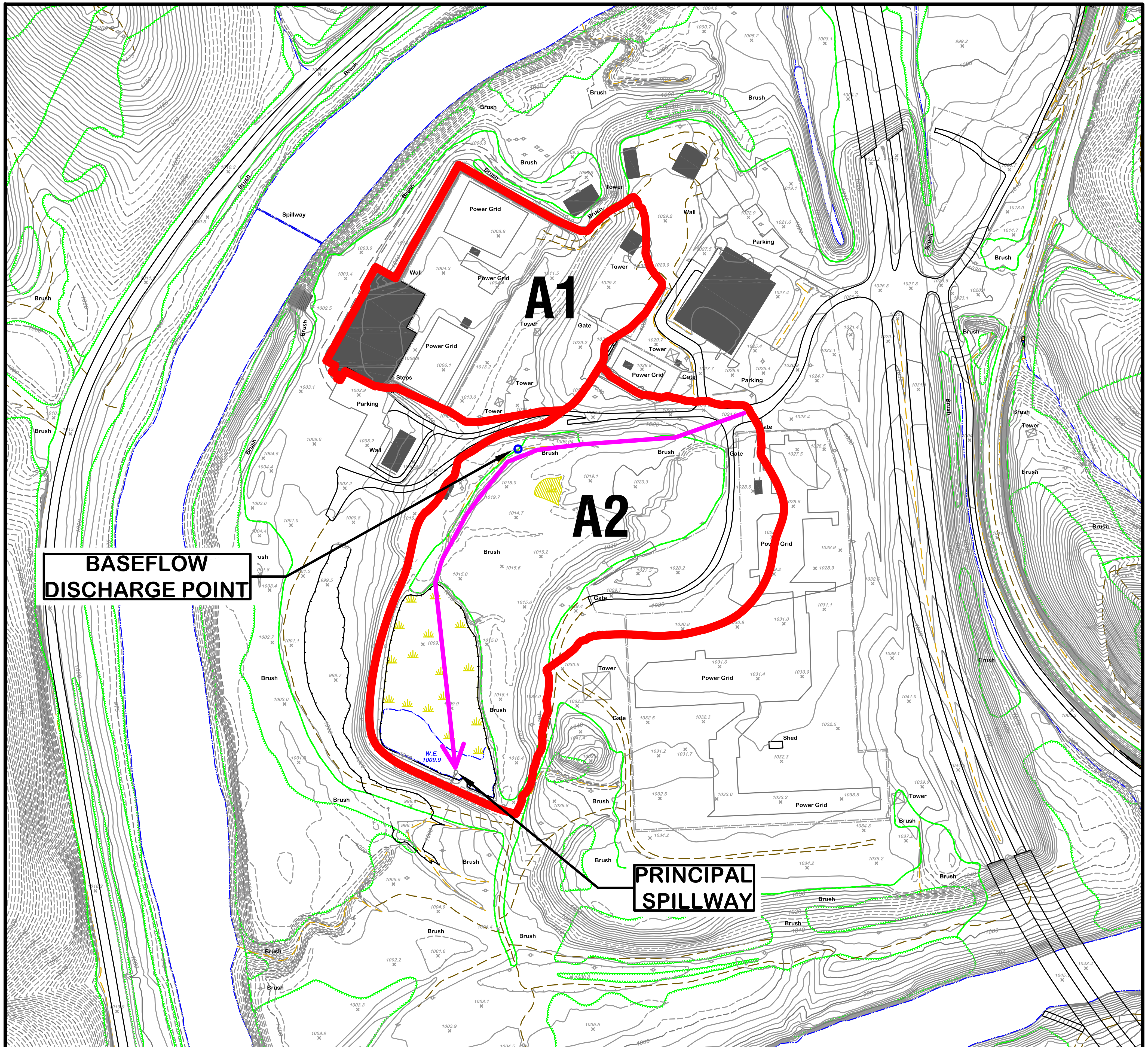
The principal spillway met all three capacity requirements set forth by KDOW with a minimum freeboard of 1.5 feet or more maintained. Based on the analyses performed, the existing condition of the Pineville Ash Pond and principal spillway adequately meet KDOW criteria and will not overtop during a significant rain event.

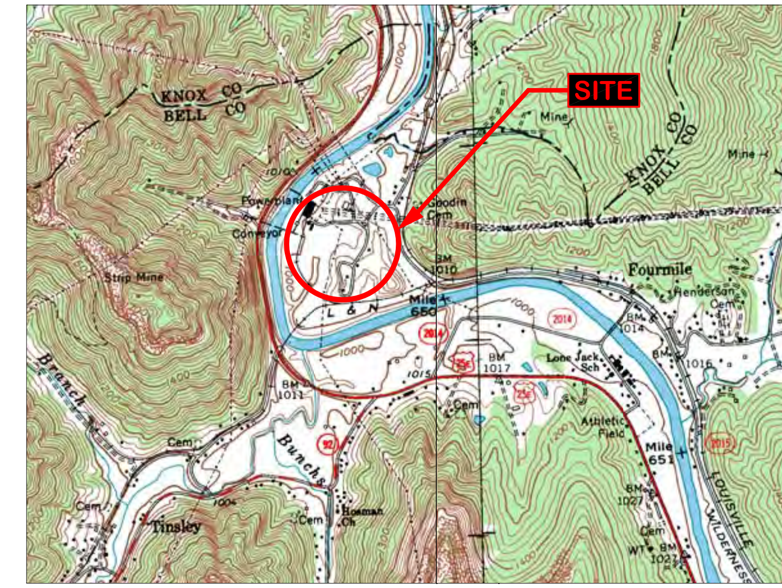
For operational purposes the following is recommended to maintain a uniform freeboard of approximately 2.00 feet at all times within the pond:

- The southwest corner of the ash pond is the lowest point of the embankment crest and should be raised to meet the average crest height elevation of 1,014 NAVD88.
- The maximum operating pool should not exceed an elevation of 1,011.00 NAVD88, which is 1.10 feet above the normal operating pool of 1,009.9 NAVD88.

Appendices

A. Project Location & Drainage Area Map





LOCATION MAP

LEGEND

- Drainage Flow Path
- Obscured Contour
- Depression Contour
- Tree Line
- Brush Line
- Unpaved Road
- Edge of Water
- Stream
- Fence Line
- Utility Pole
- Water Elevation
- Photo Control Point
- Swamp

NOTES:

1. Source of Topographic Information: From ground control surveys dated December 22, 2009 by L.R. Kimball Assoc., INC. and from aerial photography dated December 29, 2009.
2. Horizontal control is based on NAD83 Coordinates provided by L.R. Kimball Assoc., INC
3. Vertical control is based on an NAVD88 datum provided by L.R. Kimball Assoc., INC
4. Mapping scale of 1"=100' with 2' and 5' Contour Interval.

DRAINAGE AREAS (ACRES)	
A1	06.84
A2	13.49

Title:
ASH POND
DRAINAGE AREA MAP

Location and Unit:
SCHEMATIC DIAGRAM
PINEVILLE
BELL COUNTY, KENTUCKY

Scale: 1"=250'
Drawn: HDL
Drawn Date: 11/29/2010
Checked: R.W.
Checked Date: 11/29/2010
Approved: RETA_WHITE

KU Kentucky Utilities Company

JOB NO. 125914

DRAWING_NO 1

Rev. 0

DMS_VERSION

B. Design Drawings

COORDINATE LOCATION SCHEDULE		
COORD. NO.	NORTH	EAST
1	N 49,003	E 99,410
2	N 49,064.06	E 99,290.72
3	N 49,153	E 99,117
4	N 49,491	E 99,161
5	N 49,707	E 99,301
6	N 49,240	E 99,820
7	N 49,175	E 99,935
8	N 49,250	E 100,105
9	N 49,450	E 100,330
10	N 49,595	E 100,292
11	N 49,435	E 99,220
12	N 49,400	E 99,325

NOTES

1. FOR GENERAL NOTES, SEE DWG. C-2
2. THE ASH POND AREA BELOW ELEVATION 1015.0' SHALL BE CLEARED AS DEFINED IN S&L STD. SPEC. 1714.

ANY MODIFICATION OR ADDITION TO THIS DRAWING BY AN ORGANIZATION OTHER THAN SARGENT & LUNDY IS NOT THE RESPONSIBILITY OF SARGENT & LUNDY

REFERENCE DRAWINGS

C-2	SITE PLAN - PLANT & SWITCHYARD AREA
C-7	ASH POND AREA - SECTIONS & DETAILS
S-11	ASH POND WEIRBOX STRUCTURE

DRAWING RELEASE RECORD

REV.	SPEC. NO.	DATE	DRAWN	CHECKED	ENGR. APPROVAL	DESCRIPTION	FILM

DRAWING RELEASE RECORD

REV.	SPEC. NO.	DATE	DRAWN	CHECKED	ENGR. APPROVAL	DESCRIPTION	FILM
A	J-2844	12-1-76	A.U. Baligh	—	—	GENERAL WORK BIDS	X
B	G-3043	1-14-77	D. Luijano	—	—	GENERAL WORK BIDS, ADDENDUM NO. 2	X
C	G-3043	3-10-77	Q.P. Odicho	D.H. Bhatt	N.L. Rabbers	FOR CONSTRUCTION	X
C	—	7-25-88	—	—	—	SENT TO CLIENT (BY A.C. BROWN)	X

STATE OF KENTUCKY
J. M. McLAUGHLIN
9039
REGISTERED PROFESSIONAL ENGINEER

Thomas M. Bailey DRAWN 11-3-76	1" = 50'-0" SCALE
D.H. Bhatt CHECKED	3-3-77 DATE
N.L. Rabbers ENGINEER	3-4-77 DATE
J.M. McLaughlin APPROVED	3-4-77 DATE

PROJECT NUMBER 4973-00

SITE PLAN
COAL PILE AREA
PINEVILLE POWER STATION
KENTUCKY UTILITIES COMPANY
PINEVILLE, KENTUCKY

SARGENT & LUNDY ENGINEERS CHICAGO

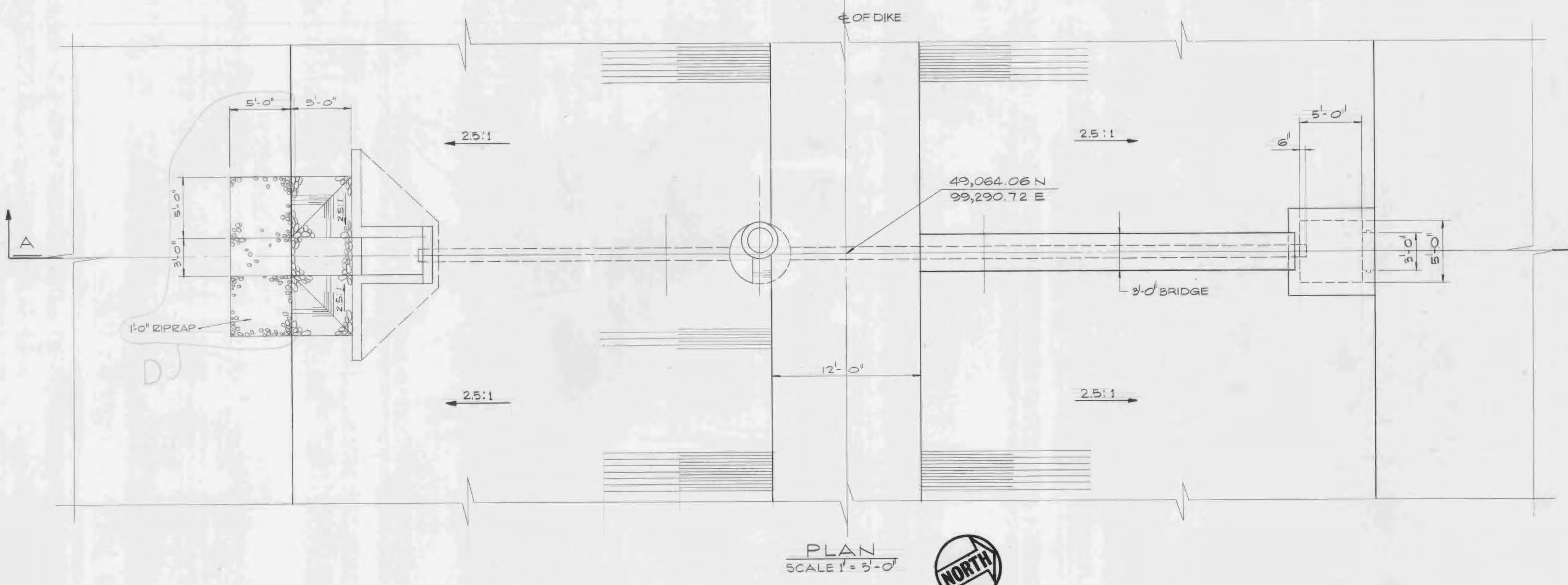
DRAWING NO. C-1 REV. C

SHEET OF

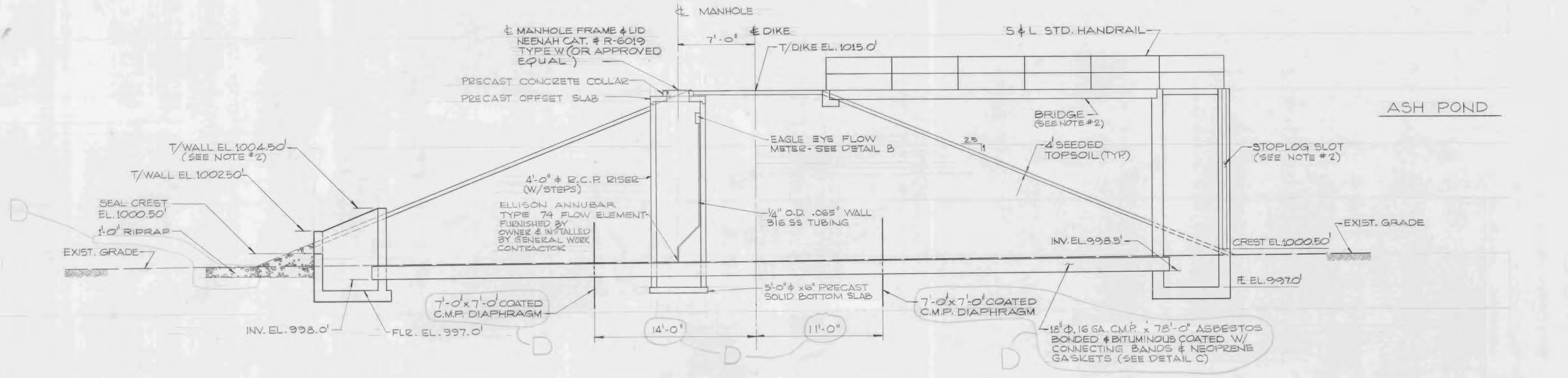
SHEET C-1

DO NOT USE I, O, Q OR X FOR REVISION

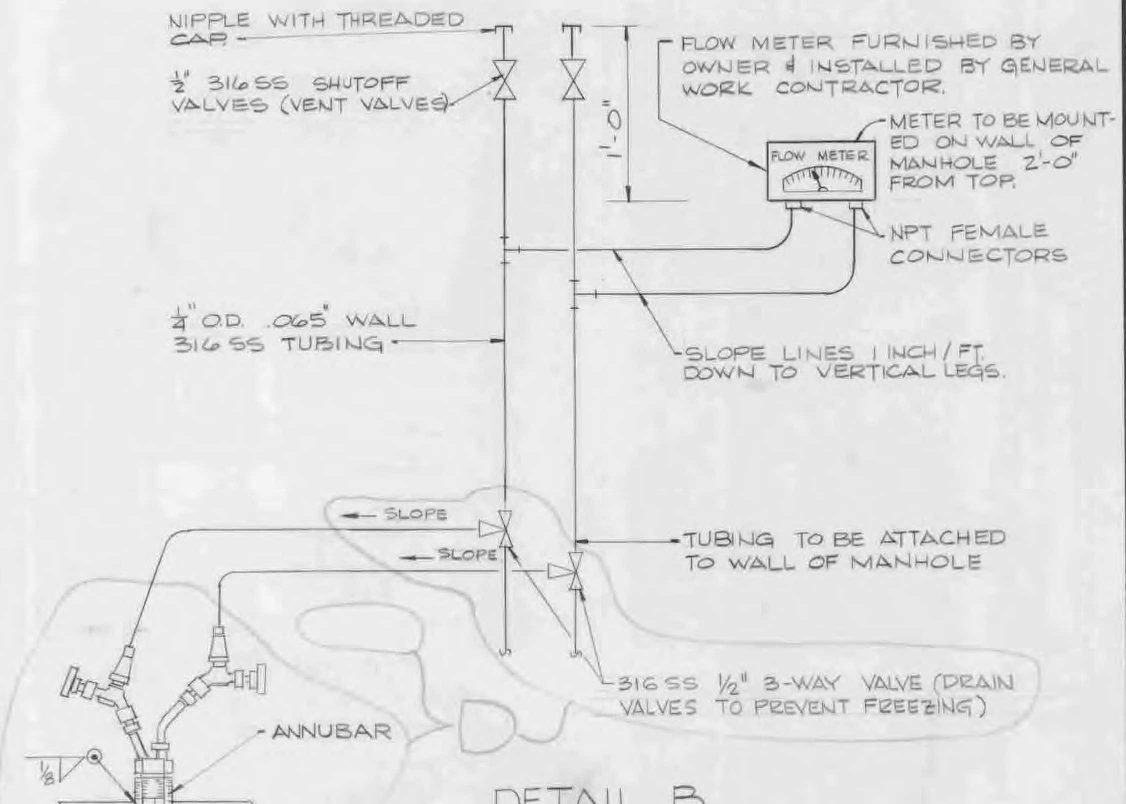
C-5



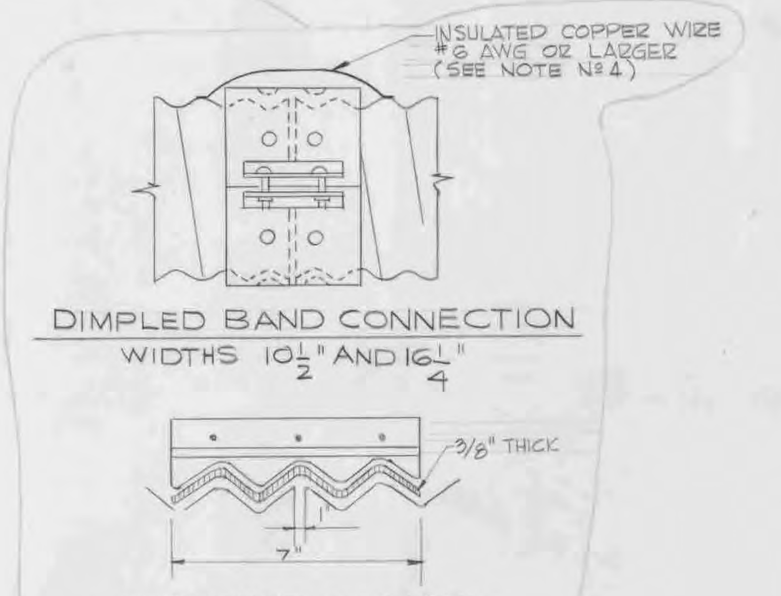
PLAN
SCALE 1" = 5'-0"



SECTION A
SCALE 1" = 5'-0"



DETAIL B
N.T.S.



DIMPLED BAND CONNECTION
WIDTHS $10\frac{1}{2}$" AND $16\frac{1}{4}$"

NEOPRENE GASKET

DETAIL C

NOTES

1. FOR GENERAL NOTES, SEE DWG. C-2.
2. FOR REINFORCEMENT & STRUCTURAL DETAILS SEE DWG. S-11.
3. RIPRAP SHALL BE 4" AVERAGE STONE DIA. WITH A MAXIMUM OF 6" STONE DIA.
4. ATTACH SECURELY WITH #6 AWG OR LARGER INSULATED COPPER WIRE, W/600 VOLT RATING, TO UNCOATED PIPE METAL AT BOTH SIDES OF THE JOINT. BARE WIRE & EXPOSED PIPE METAL AT THE POINTS OF CONNECTION ARE TO BE THOROUGHLY COATED WITH A COATING EQUIVALENT TO THE ORIGINAL PIPE COATING.

REFERENCE DRAWINGS

C-2	SITE PLAN - PLANT & SWITCHYARD AREA
C-1	SITE PLAN - COAL PILE AREA
C-7	ASH POND AREA - SECTIONS & DETAILS
S-11	ASH POND WEIRBOX STRUCTURE

ANY MODIFICATION OR ADDITION TO THIS DRAWING BY AN ORGANIZATION OTHER THAN SARGENT & LUNDY IS NOT THE RESPONSIBILITY OF SARGENT & LUNDY

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE	FILM

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE	FILM
A	12-1-76	Blanchez	—	—	GENERAL WORK BIDS, SPEC. No. J-2844	
B	1-14-77	[illegible]	—	—	GENERAL WORK BIDS, SPEC. NO. G-3043, ADDENDUM NO. 2 (REDRAWN)	X
C	3-10-77	Alex P. Odishoo Jr.	D.H. Bhatt	J.M. McLaughlin	FOR CONSTRUCTION, SPEC. NO. G-3043	X
D	4-18-77	Alex P. Odishoo Jr.	D.H. Bhatt	M.L. Robbers	REVISED DET. B, FLOW MEASUREMENT PIPE, RIPRAP, PIPE DIAPHRAMS, ADDED DET. C AND NOTE No 4. SPEC. No 3043.	X
D	7-25-88	—	—	—	SENT TO CLIENT (BY [illegible])	X

STATE OF KENTUCKY
J. M. McLAUGHLIN
9039
REGISTERED
PROFESSIONAL ENGINEER

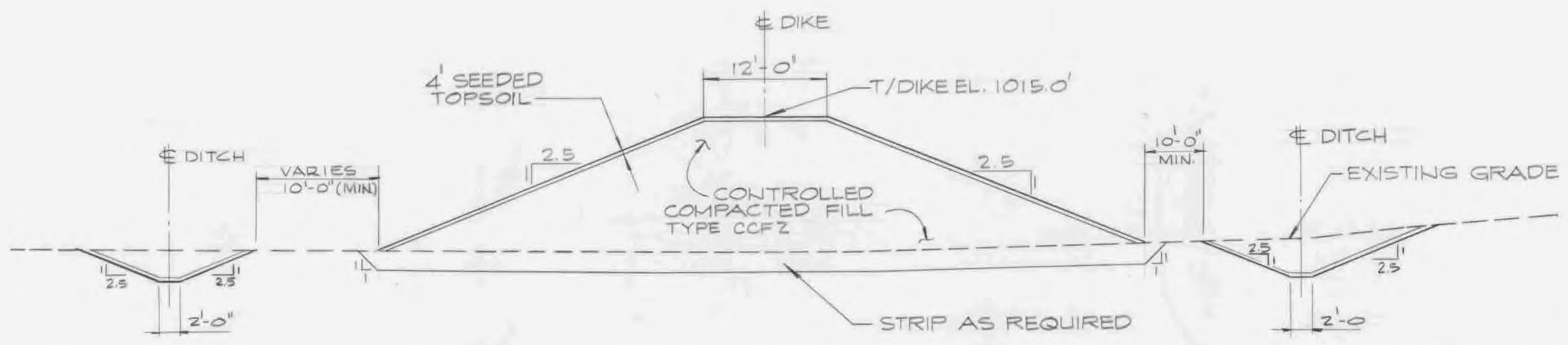
SEAL

SCALE
AS NOTED
PROJECT NUMBER
4973-00

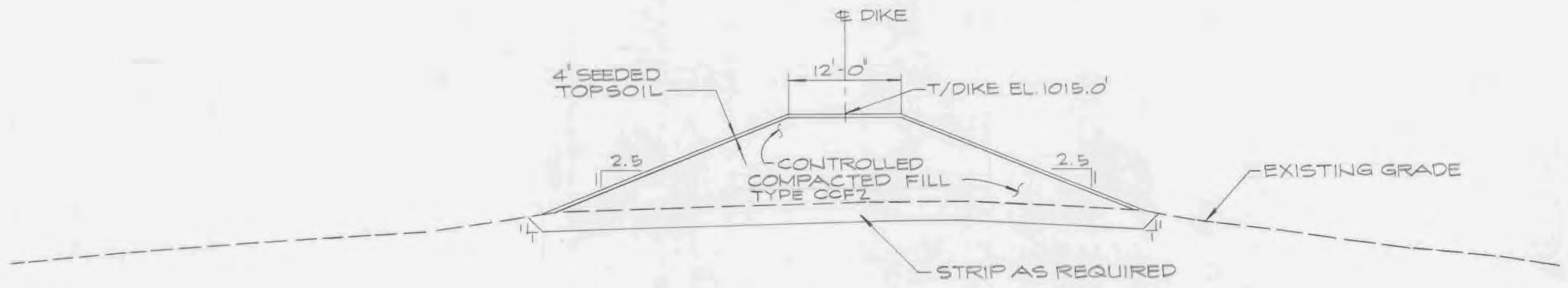
ASH POND FLOW MEASUREMENT STRUCTURE
PLAN & SECTIONS
PINEVILLE POWER STATION
KENTUCKY UTILITIES COMPANY
PINEVILLE, KENTUCKY

SARGENT & LUNDY
ENGINEERS
CHICAGO

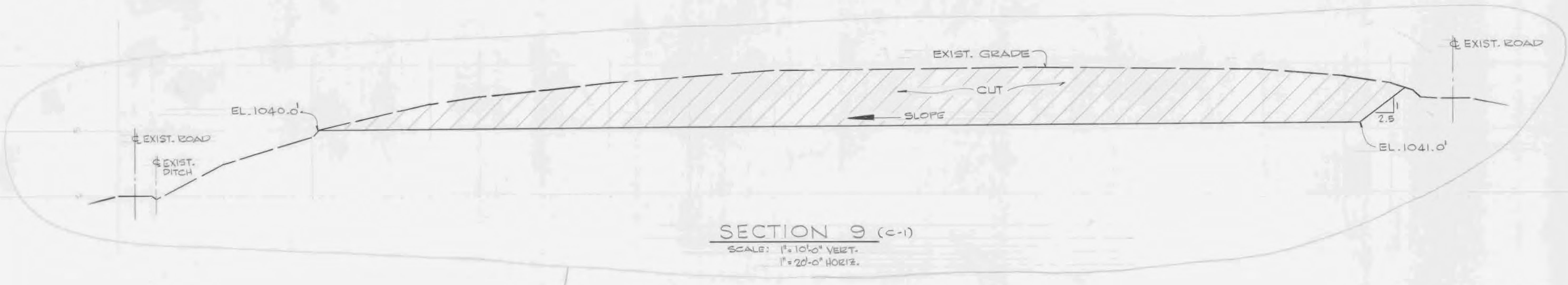
DRAWING NO. C-5
REV. D
SHEET OF



SECTION 6 (C-1)



SECTION 7 (C-1)



SECTION 9 (C-1)
SCALE: 1" = 10'-0" VERT.
1" = 20'-0" HORIZ.

C

NOTES

1. FOR GENERAL NOTES, SEE DWG. C-2.

REFERENCE DRAWINGS

C-1 SITE PLAN - COAL PILE AREA

ANY MODIFICATION OR ADDITION TO THIS DRAWING BY AN ORGANIZATION OTHER THAN SARGENT & LUNDY IS NOT THE RESPONSIBILITY OF SARGENT & LUNDY

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE	FILM
A	12-1-76	[illegible]			GENERAL WORK BIDS, SPEC. NO. J-2844	
B	1-14-77	[illegible]			GENERAL WORK BIDS, SPEC. NO. G-3043, ADDENDUM NO. 2 (REDRAWN)	X
C	3-10-77	Q.P. Odishoo Jr.	DHBhatt	JMcLaughlin	FOR CONSTRUCTION, SPEC. NO. G-3043	X
C	7-25-88	—	—	—	SENT TO CLIENT (BY [illegible])	

STATE OF KENTUCKY
J. M. McLAUGHLIN
9039
REGISTERED PROFESSIONAL ENGINEER
SEAL

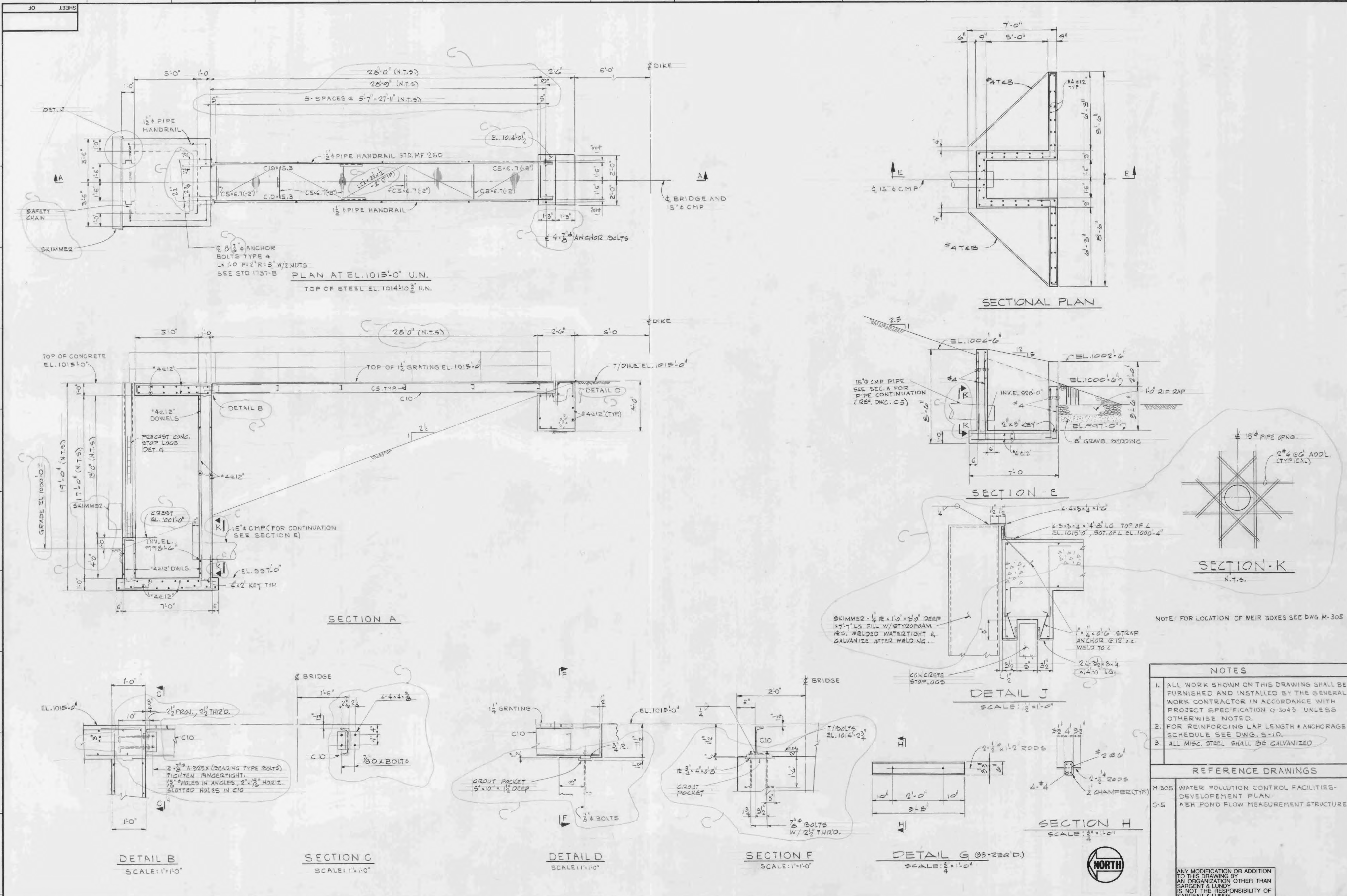
SCALE 1" = 10'-0"
PROJECT NUMBER 4273-00

ASH POND AREA
SECTIONS & DETAILS
PINEVILLE POWER STATION
KENTUCKY UTILITIES COMPANY
PINEVILLE, KENTUCKY

SARGENT & LUNDY
ENGINEERS
CHICAGO

DRAWING NO. C-7
REV. C
SHEET OF

C-7
SHEET OF



NOTES

1. ALL WORK SHOWN ON THIS DRAWING SHALL BE FURNISHED AND INSTALLED BY THE GENERAL WORK CONTRACTOR IN ACCORDANCE WITH PROJECT SPECIFICATION G-3043 UNLESS OTHERWISE NOTED.
2. FOR REINFORCING LAP LENGTH & ANCHORAGE SCHEDULE SEE DWG. S-10.
3. ALL MISC. STEEL SHALL BE GALVANIZED

REFERENCE DRAWINGS

M-305	WATER POLLUTION CONTROL FACILITIES-DEVELOPEMENT PLAN
G-5	ASH POND FLOW MEASUREMENT STRUCTURE

ANY MODIFICATION OR ADDITION TO THIS DRAWING BY AN ORGANIZATION OTHER THAN SARGENT & LUNDY IS NOT THE RESPONSIBILITY OF SARGENT & LUNDY

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE	FILM

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE	FILM
A	12-1-76	M. Roczeski			GENERAL WORK BIDS SPEC. G-3043	
B	1-14-77	M. Crane			ADDENDUM #2 SPEC. G-3043	
C	3-10-77	M. PETERSEN	C. Balaganas	JMcLaughlin	FOR CONSTRUCTION SPEC. G-3043	
C	7-25-88	—	—	—	SENT TO CLIENT (BY AF Poba)	

STATE OF KENTUCKY
J. M. McLAUGHLIN
9039
REGISTERED PROFESSIONAL ENGINEER
SEAL

SCALE: 3/8"=1'-0" U.N.
PROJECT NUMBER: 4973-00
EO

ASH POND WEIR BOX
STRUCTURE
WATER POLLUTION CONTROL FAC.
PINEVILLE POWER STATION
KENTUCKY UTILITIES CO.
PINEVILLA, KENTUCKY..

SARGENT & LUNDY
ENGINEERS
CHICAGO

DRAWING NO. S-11
REV. C
SHEET OF

C. HEC-HMS Output

Project: PAP-H&H Simulation Run: Primary

Start of Run:	01Jan2010, 00:00	Basin Model:	PAP
End of Run:	02Jan2010, 00:01	Meteorologic Model:	Primary Spillway
Compute Time:	06Jan2011, 11:04:55	Control Specifications:	Principal

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Watershed	0.021	71.2	01Jan2010, 12:04	5.81
Pond	0.021	10.1	01Jan2010, 12:38	5.45

Project: PAP-H&H

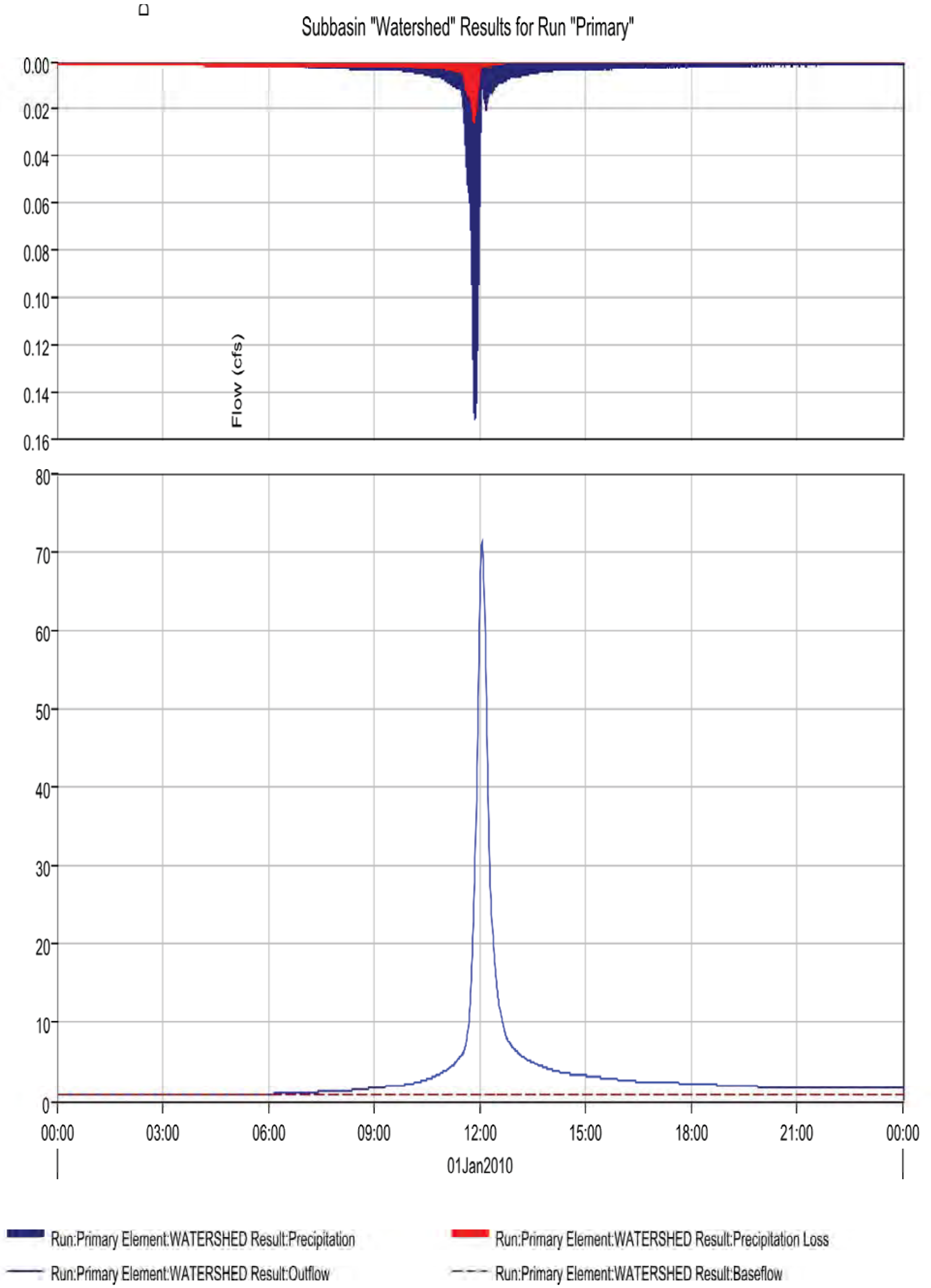
Simulation Run: Primary Subbasin: Watershed

Start of Run:	01Jan2010, 00:00	Basin Model:	PAP
End of Run:	02Jan2010, 00:01	Meteorologic Model:	Primary Spillway
Compute Time:	06Jan2011, 11:04:55	Control Specifications:	Principal

Volume Units: IN

Computed Results

Peak Discharge :	71.2 (CFS)	Date/Time of Peak Discharge :	01Jan2010, 12:04
Total Precipitation :	6.30 (IN)	Total Direct Runoff :	4.46 (IN)
Total Loss :	1.82 (IN)	Total Baseflow :	1.35 (IN)
Total Excess :	4.48 (IN)	Discharge :	5.81 (IN)



Subbasin "Watershed" Results for Run "Primary"
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
Flow (cfs)
80
70
60
50
40
30
20
10
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
01Jan2010
Run:Primary Element:WATERSHED Result:Precipitation
Run:Primary Element:WATERSHED Result:Precipitation Loss
Run:Primary Element:WATERSHED Result:Outflow
Run:Primary Element:WATERSHED Result:Baseflow

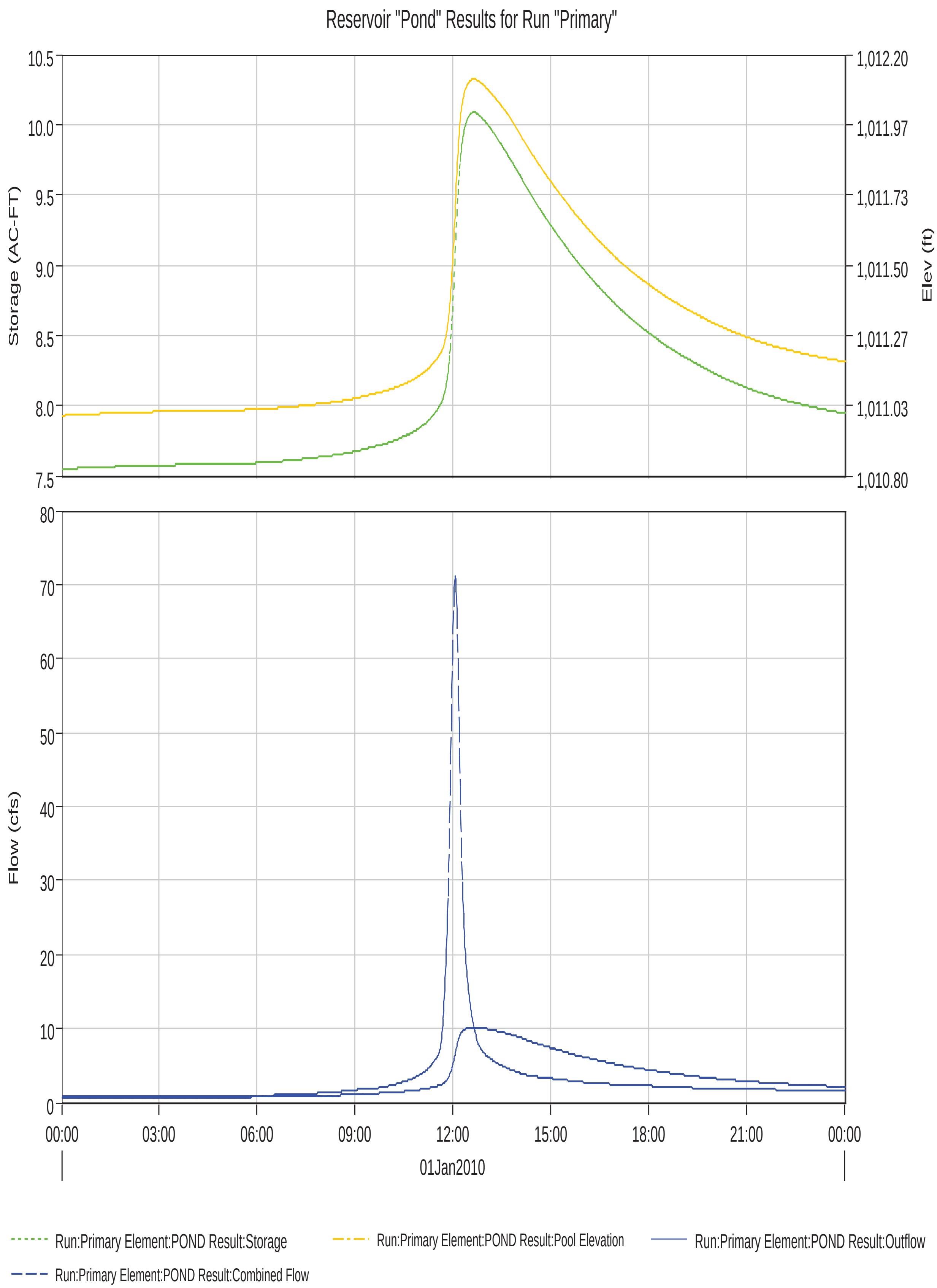
Project: PAP-H&H
Simulation Run: Primary Reservoir: Pond

Start of Run:	01Jan2010, 00:00	Basin Model:	PAP
End of Run:	02Jan2010, 00:01	Meteorologic Model:	Primary Spillway
Compute Time:	06Jan2011, 11:04:55	Control Specifications:	Principal

Volume Units: IN

Computed Results

Peak Inflow :	71.2 (CFS)	Date/Time of Peak Inflow :	01Jan2010, 12:04
Peak Outflow :	10.1 (CFS)	Date/Time of Peak Outflow :	01Jan2010, 12:38
Total Inflow :	5.81 (IN)	Peak Storage :	10.1 (AC-FT)
Total Outflow :	5.45 (IN)	Peak Elevation :	1012.1 (FT)



Reservoir "Pond" Results for Run "Primary"
Storage (AC-FT)
Elev (ft)
10.5
10.0
9.5
9.0
8.5
8.0
7.5
1,012.20
1,011.97
1,011.73
1,011.50
1,011.27
1,011.03
1,010.80
Flow (cfs)
80
70
60
50
40
30
20
10
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
01Jan2010
Run:Primary Element:POND Result:Storage
Run:Primary Element:POND Result:Pool Elevation
Run:Primary Element:POND Result:Outflow
Run:Primary Element:POND Result:Combined Flow

Project: PAP-H&H Simulation Run: Emergency

Start of Run:	01Jan2000, 00:00	Basin Model:	PAP
End of Run:	01Jan2000, 06:01	Meteorologic Model:	Emergency Spillway
Compute Time:	06Jan2011, 11:04:34	Control Specifications:	Emergency

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Watershed	0.021	33.9	01Jan2000, 02:34	3.26
Pond	0.021	7.3	01Jan2000, 03:52	1.93

Project: PAP-H&H

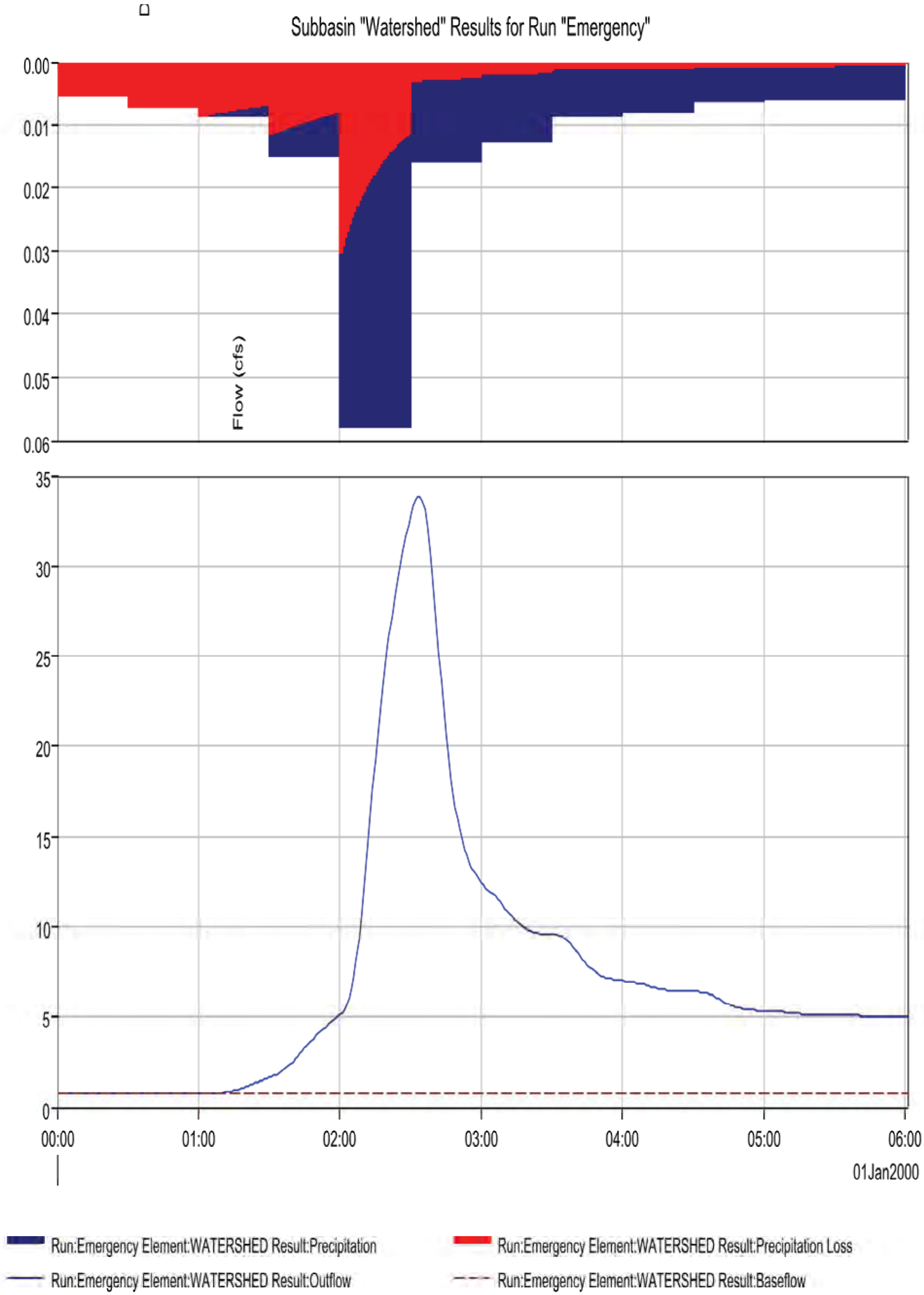
Simulation Run: Emergency Subbasin: Watershed

Start of Run:	01Jan2000, 00:00	Basin Model:	PAP
End of Run:	01Jan2000, 06:01	Meteorologic Model:	Emergency Spillway
Compute Time:	06Jan2011, 11:04:34	Control Specifications:	Emergency

Volume Units: IN

Computed Results

Peak Discharge :	33.9 (CFS)	Date/Time of Peak Discharge :	01Jan2000, 02:34
Total Precipitation :	4.70 (IN)	Total Direct Runoff :	2.93 (IN)
Total Loss :	1.70 (IN)	Total Baseflow :	0.34 (IN)
Total Excess :	3.00 (IN)	Discharge :	3.26 (IN)



Subbasin "Watershed" Results for Run "Emergency"
0.00
0.01
0.02
0.03
0.04
0.05
0.06
Flow (cfs)
35
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
01Jan2000
Run:Emergency Element:WATERSHED Result:Precipitation
Run:Emergency Element:WATERSHED Result:Precipitation Loss
Run:Emergency Element:WATERSHED Result:Outflow
Run:Emergency Element:WATERSHED Result:Baseflow

Project: PAP-H&H

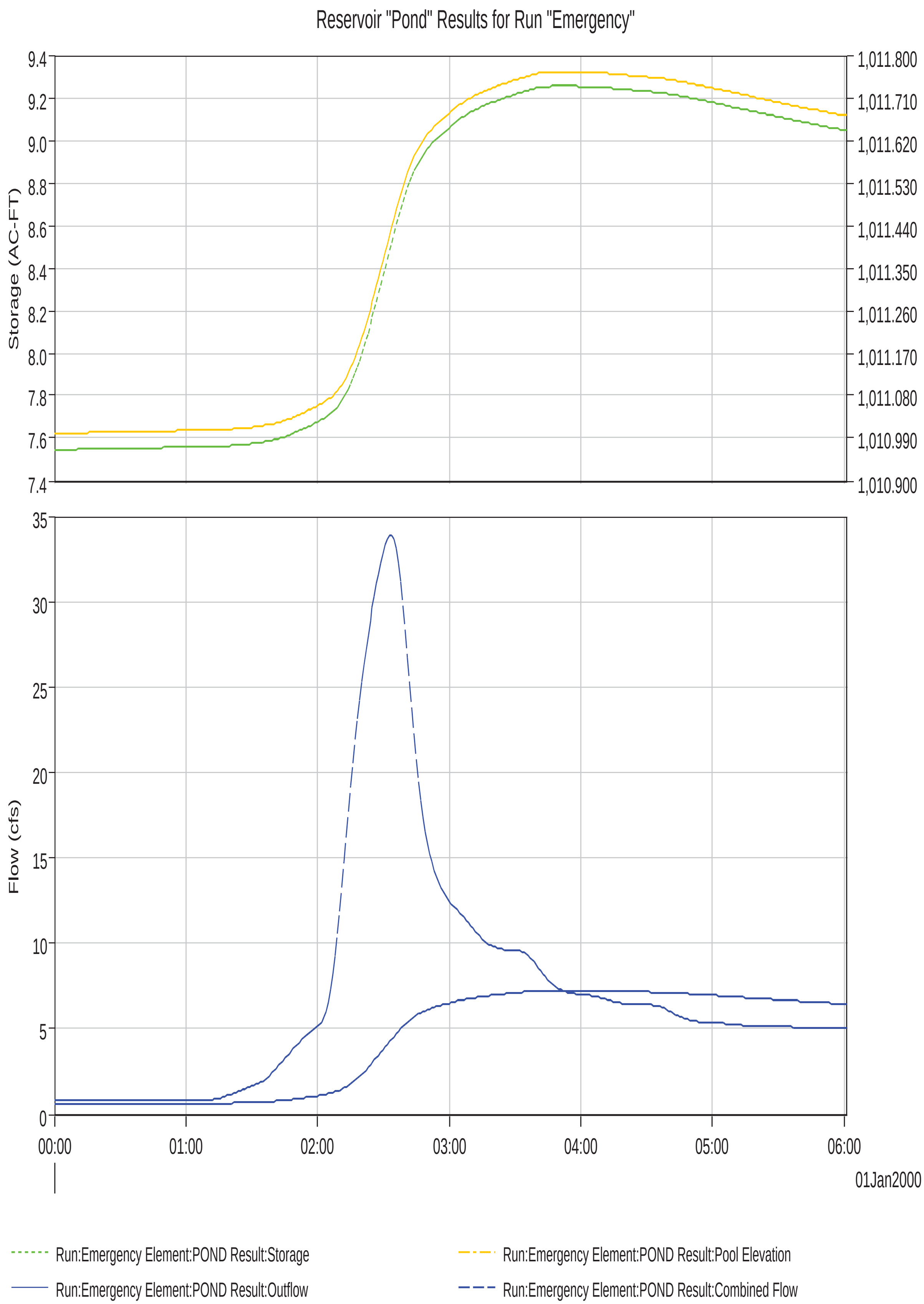
Simulation Run: Emergency Reservoir: Pond

Start of Run:	01Jan2000, 00:00	Basin Model:	PAP
End of Run:	01Jan2000, 06:01	Meteorologic Model:	Emergency Spillway
Compute Time:	06Jan2011, 11:04:34	Control Specifications:	Emergency

Volume Units: IN

Computed Results

Peak Inflow :	33.9 (CFS)	Date/Time of Peak Inflow :	01Jan2000, 02:34
Peak Outflow :	7.3 (CFS)	Date/Time of Peak Outflow :	01Jan2000, 03:52
Total Inflow :	3.26 (IN)	Peak Storage :	9.3 (AC-FT)
Total Outflow :	1.93 (IN)	Peak Elevation :	1011.8 (FT)



Reservoir "Pond" Results for Run "Emergency"
Storage (AC-FT)
Elev (ft)
Flow (cfs)
9.4
9.2
9.0
8.8
8.6
8.4
8.2
8.0
7.8
7.6
7.4
1,011.800
1,011.710
1,011.620
1,011.530
1,011.440
1,011.350
1,011.260
1,011.170
1,011.080
1,010.990
1,010.900
35
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
01Jan2000
Run:Emergency Element:POND Result:Storage
Run:Emergency Element:POND Result:Pool Elevation
Run:Emergency Element:POND Result:Outflow
Run:Emergency Element:POND Result:Combined Flow

Project: PAP-H&H Simulation Run: Freeboard

Start of Run:	01Jan2000, 00:00	Basin Model:	PAP
End of Run:	01Jan2000, 06:01	Meteorologic Model:	Freeboard
Compute Time:	06Jan2011, 11:04:46	Control Specifications:	Freeboard

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Watershed	0.021	63.4	01Jan2000, 02:33	5.93
Pond	0.021	12.4	01Jan2000, 03:49	3.31

Project: PAP-H&H

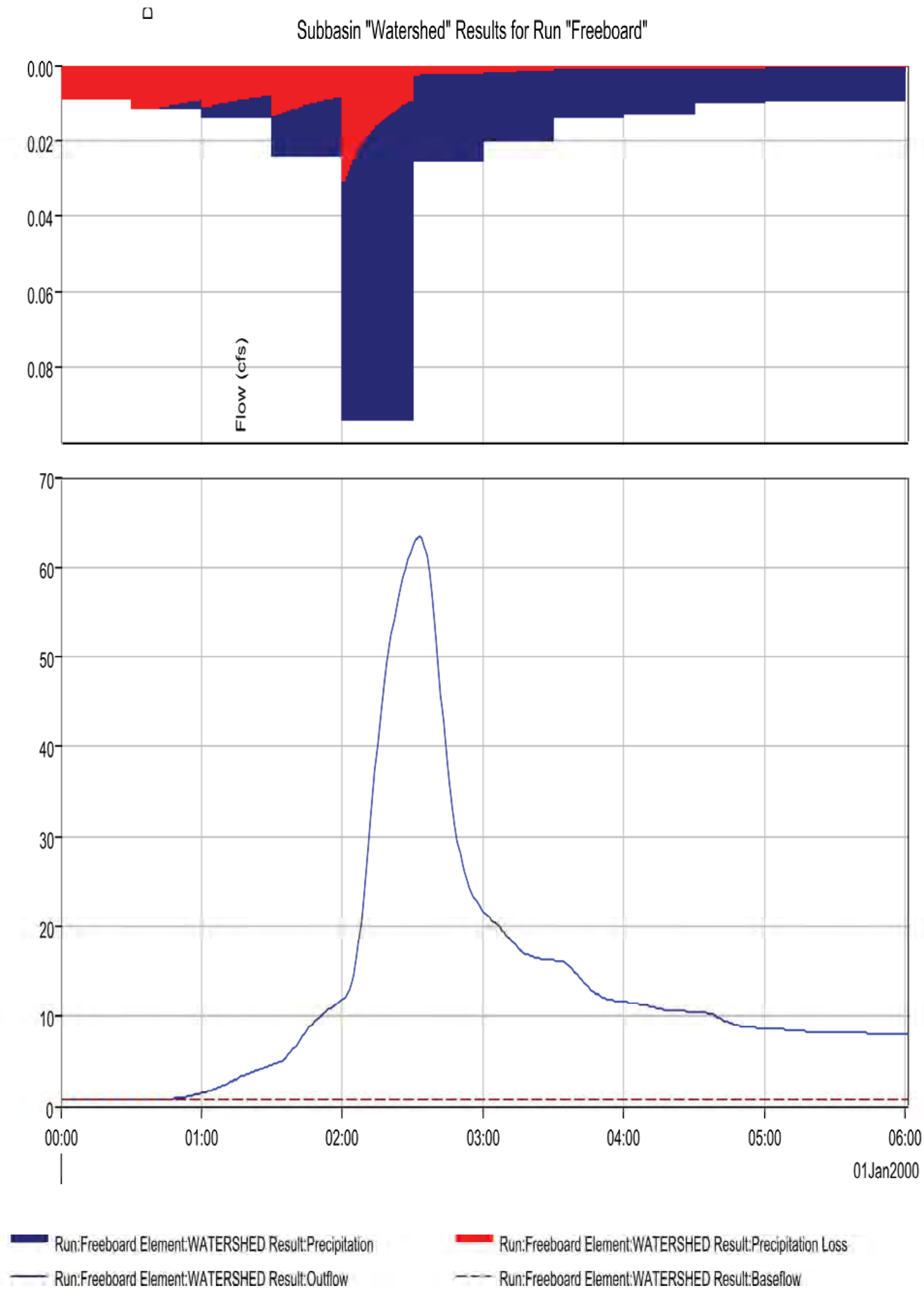
Simulation Run: Freeboard Subbasin: Watershed

Start of Run:	01Jan2000, 00:00	Basin Model:	PAP
End of Run:	01Jan2000, 06:01	Meteorologic Model:	Freeboard
Compute Time:	06Jan2011, 11:04:46	Control Specifications:	Freeboard

Volume Units: IN

Computed Results

Peak Discharge :	63.4 (CFS)	Date/Time of Peak Discharge :	01Jan2000, 02:33
Total Precipitation :	7.60 (IN)	Total Direct Runoff :	5.59 (IN)
Total Loss :	1.89 (IN)	Total Baseflow :	0.34 (IN)
Total Excess :	5.71 (IN)	Discharge :	5.93 (IN)


Subbasin "Watershed" Results for Run "Freeboard"
0.00
0.02
0.04
0.06
0.08
Flow (cfs)
70
60
50
40
30
20
10
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
01Jan2000
Run:Freeboard Element:WATERSHED Result:Precipitation
Run:Freeboard Element:WATERSHED Result:Precipitation Loss
Run:Freeboard Element:WATERSHED Result:Outflow
Run:Freeboard Element:WATERSHED Result:Baseflow

Project: PAP-H&H

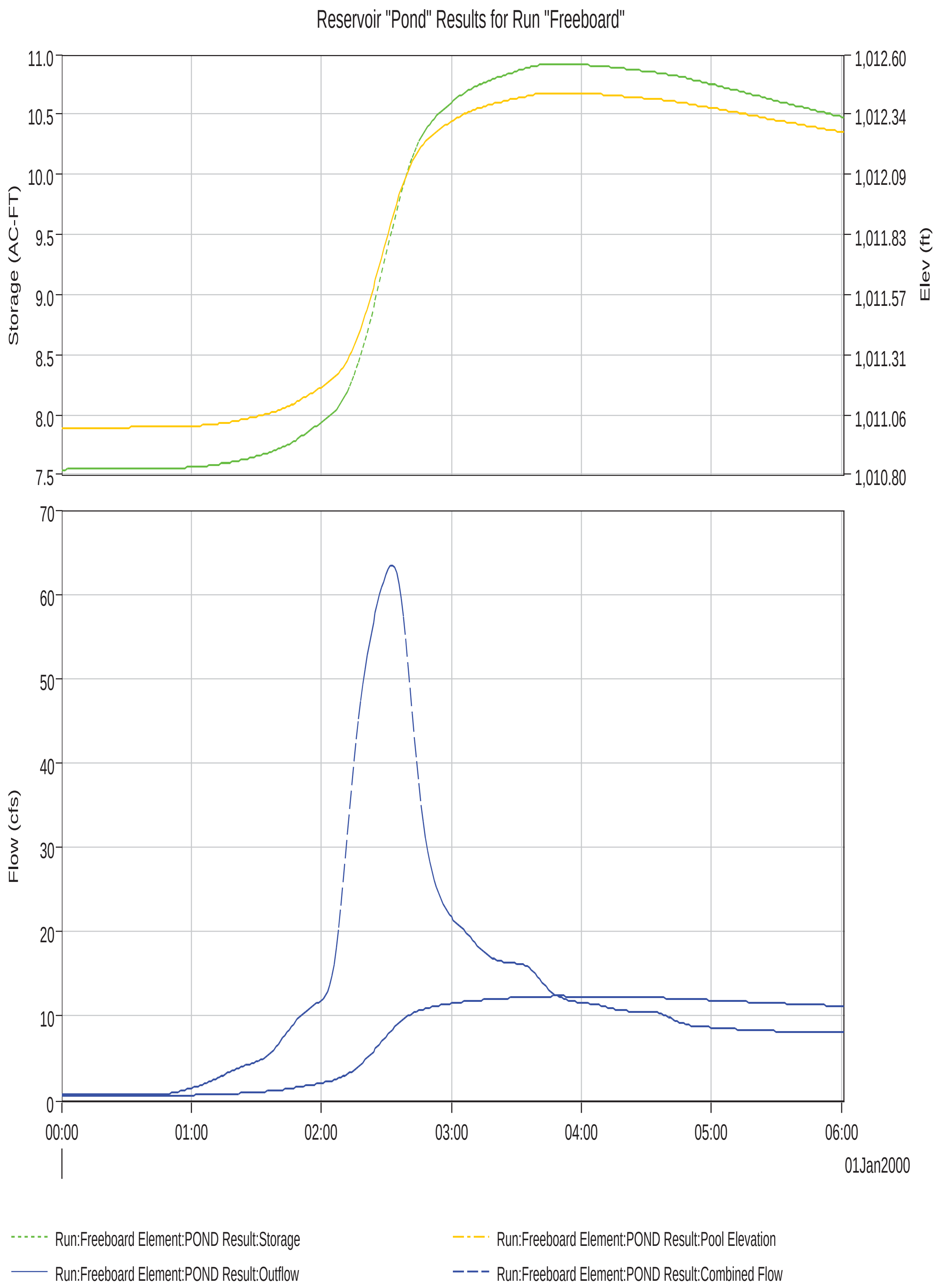
Simulation Run: Freeboard Reservoir: Pond

Start of Run:	01Jan2000, 00:00	Basin Model:	PAP
End of Run:	01Jan2000, 06:01	Meteorologic Model:	Freeboard
Compute Time:	06Jan2011, 11:04:46	Control Specifications:	Freeboard

Volume Units: IN

Computed Results

Peak Inflow :	63.4 (CFS)	Date/Time of Peak Inflow :	01Jan2000, 02:33
Peak Outflow :	12.4 (CFS)	Date/Time of Peak Outflow :	01Jan2000, 03:49
Total Inflow :	5.93 (IN)	Peak Storage :	10.9 (AC-FT)
Total Outflow :	3.31 (IN)	Peak Elevation :	1012.4 (FT)



Reservoir "Pond" Results for Run "Freeboard"
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
Storage (AC-FT)
1,012.60
1,012.34
1,012.09
1,011.83
1,011.57
1,011.31
1,011.06
1,010.80
Elev (ft)
70
60
50
40
30
20
10
0
Flow (cfs)
00:00
01:00
02:00
03:00
04:00
05:00
06:00
01Jan2000
Run:Freeboard Element:POND Result:Storage
Run:Freeboard Element:POND Result:Pool Elevation
Run:Freeboard Element:POND Result:Outflow
Run:Freeboard Element:POND Result:Combined Flow

<u>Attachment 4</u>

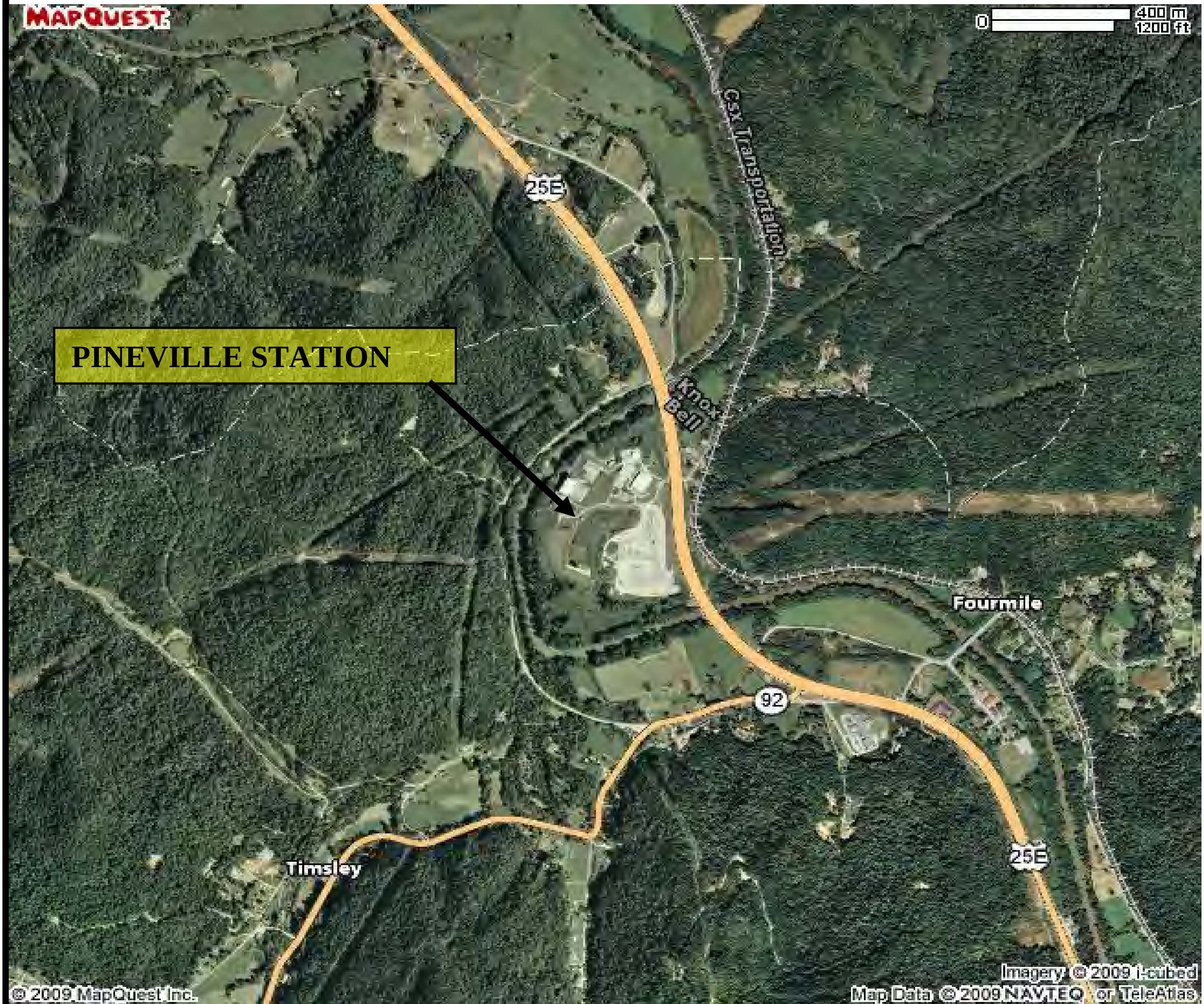
Cover pages, cover letter, appendices A and C of
2011 Pond Inspections Visual Site Assessment Report Six Impoundment Facilities

January 25, 2011
ATC Associates, Inc.

Appendix C
KU Pineville Station

Appendix C
KU Pineville Station

List of Contents



ATC ASSOCIATES INC.

11001 Bluegrass Parkway, Suite 250
Louisville, KY 40299
(502) 722-1401

SITE VICINITY MAP

KU PINEVILLE STATION
LG&E and KU 2011 Pond Inspections
Pineville, KY

PROJECT NO: 27.11000.1G37		
DESIGNED BY: RR	SCALE:N/A	REVIEWED BY: JE
DRAWN BY: RR	DATE: 1/17/11	FIGURE: C-1

Map provided by mapquest.com

Findings and Recommendations

Plant: **Pineville**
Structure: **Ash Pond**
State ID# **Non-classified**
Field date: **1/18/2011**

Item #	Priority Rating	GPS Point	Photo #	Location Description	Action Item
1	High	P1, P2, P3	1,2	Interior Slope	Repair all animal burrows into upstream slope (6 locations noted)
2	High	P9	3	Spillway	Clearly mark highest allowable stoplog elevation on principal spillway. Elevation determined by others. Include instruction in Operation manual for pond.
3	Moderate	P2, P10	5	Interior Slope	Seed areas of sparse vegetation on upstream slopes. Seed all repaired areas.
4	Moderate	P6	8	Exterior Slope	Repair ruts and replace vegetation where damaged from mowing
5	Normal	P11	9	Crest	Fill low area at upstream crest to restore to nominal width.
6	Normal	multiple	1,4	Interior Slope	Cut vegetation at waterline on upstream slopes spray with herbicide, or excavate ash at toe to increase water depth.
7	Normal	P7	6	Below Toe	Repair or remove partially blocked culvet draining ditch at base of toe.
8	Normal	P8	7	Spillway	Monitor wet areas on concrete lip adjacent to spillway weir for increased flow.

Priority:
High - Recommend that action item be addressed as soon as possible
Moderate - Recommend that action item be addressed during next construction season
Normal - Recommend that action item be as part of ongoing maintenance of the structure

Location:

Crest	Interior Slope	Principal Spillway
Toe	Exterior Slope	Emergency Spillway
Abutment		

DAM ASSESSMENT FORM

Name of Professional Conducting Inspection: Mark J. Schuhmann P.E.	KY Professional License No.: 12500
Company Name: ATC Associates Inc.	Phone: 502-722-1401
Address: 11001 Bluegrass Parkway, Suite 250, Louisville, KY 40299	
Inspection Preparation: Reviewed all pertinent technical documentation related to this dam and site in: the State's files Yes ☐ No ☒ ; and Owner's Files: Yes ☒ No ☐ - N/A	
Comments: Side Hill Pond. Pond has not accepted ash since plant shutdown in 2001. Pond now receives water from sump discharges and runoff from transformer yard. Pond has embankment on south and west sides.	

Dam/Pond Name: **Pineville Ash Pond**		KDEP Hazard Class: N/A	Topographic Quad: Artemus	Date of Inspection: 1/18/11
State Dam ID: N/A	County: Bell	Latitude: 36º 47' 44.82"	Longitude: 83º 45' 28.26"	Last ATC Inspection: 10/23/09

Power Station Name: **KU Pineville Station**	
Address: U. S. Highway 25 East Pineville, Bell County, KY 40977	
Site Contact: Dave Beck	Phone: 859-748-4422

Drainage Area (AC): estimated at 15	Surface Area(AC): 10	Height (Ft): 17	Crest Length (Ft): 900	Crest Width (Ft): 15	Crest Elevation (Ft): N/A
Slope (H:V) Downstream: 2.2:1 Upstream: 2.2:1	Principal Spillway Type: Concrete Drop inlet	Principal Spillway Size(In): unknown	Spillway Control Elevation: Stoplogs	Freeboard(Ft): 4.82	
CCP/Fluids in Pond: Fly ash, Bottom Ash, Sump water, Storm water runoff	Emergency Spillway Type: None	Emergency Spillway Size: N/A	Spillway Control Elevation: N/A	Freeboard(Ft): N/A	

FIELD CONDITIONS OBSERVED

CCP Above Crest:Yes:☒ None:☐	Location: Northern ¾ of pond	Max. Height above pool(Ft:) 2
Water Level (Below Dam Crest, Ft): ~5		
Ground Moisture Condition: Dry ☐ Wet ☒ Snow cover ☐ Other:		
Monitoring: Yes ☒ None: ☐ (☐ Gage Rod ☒ Piezometers ☐Seepage Weirs ☐ Survey Monuments ☒ Other)		
Comments: *Flow monitored with weir at principal spillway outlet. Piezometers (2) added on dam crest in 2010.*		

A **INTERIOR SLOPE**		**Problems Noted**: ☐ None ☐ Riprap – Missing, Sparse ☐ Wave Erosion ☐ Cracks ☐ Sinkholes ☐ Appears Too Steep ☐ Depressions or Bulges ☐ Slides ☒ Animal Burrows ☐ Trees, Bushes, Briars ☒ Other
GOOD	☐	***Comments***: *Cattail vegetation at waterline along all interior slopes needs cutting. Numerous (6) animal burrows into slope, all require repair. Areas of sparse vegetation noted likely in areas of previous repairs.*
ACCEPTABLE	☐	
DEFICIENT	☒	
POOR	☐	

B **CREST**		**Problems Noted**: ☐ None ☐ Ruts or Puddles ☐ Erosion ☐ Cracks ☐ Sinkholes ☐ Not Wide Enough ☒ Low Areas ☐ Misalignment ☐ Inadequate Surface Drainage ☐ Trees, Bushes, Briars ☐ Other
GOOD	☐	***Comments***: *Crest elevation appears to vary up to ½ foot. Crest width narrows at upstream edge near piezometer B1C.*
ACCEPTABLE	☒	
DEFICIENT	☐	
POOR	☐	

CCP: Coal Combustion byProducts;
Spillway Size: Pipe Dia. for drop inlet; open channel width (typically emergency or (auxiliary) spillway) at the control section, Ft;.
Freeboard: vertical distance from the emergency spillway control section to the lowest point of the crest of the dam.

DAM ASSESSMENT FORM

C EXTERIOR SLOPE	Problems Noted: ☐ None ☐ Livestock Damage ☐ Erosion, Gullies ☐ Cracks ☐ Sinkholes ☒ Appears Too Steep ☐ Depression or Bulges ☐ Slide ☐ Soft Areas ☐ Trees, Bushes, Briars ☐ Animal Burrows ☐ Other
GOOD ☐ ACCEPTABLE ☒ DEFICIENT ☐ POOR ☐	***Comments***. *Exterior slope rutted in places from mowing equipment, areas need revegetation.*

D SEEPAGE	Problems Noted: ☐ None ☐ Saturated Embankment Area ☐ Seepage Exits on Embankment ☐ Seepage Exits at Point Source ☒ Seepage Area at Toe ☐ Flow Adjacent to Outlet
GOOD ☒	**If Seepage**: ☒ Clear ☐ Muddy
ACCEPTABLE ☐	**Drain Outfalls Seen**: Yes ☐ No ☒ Flow: ☐ Clear ☐ Muddy ☐ Dry ☐ Obstructed
DEFICIENT ☐ POOR ☐	***Comments***: *Wet area on concrete at Principal Spillway outfall weir, east side. No flow observed, area is wet and should be monitored in future inspections for changes in flow.*

E PRINCIPAL SPILLWAY	**Description**: Concrete drop inlet with stop logs.
GOOD ☐ ACCEPTABLE ☒	**Problems Noted**: ☐ None ☐ Deterioration ☐ Separation ☐ Cracking ☒ Inlet, Outlet Deficiency ☐ Stilling Basin Inadequacies ☐ Trash Rack ☐ Other
DEFICIENT ☐ POOR ☐	***Comments***: *Pond water seeping through stop logs rather than over the top of the logs. Broken concrete stop logs on spillway should be discarded to prevent use. Stop logs could be placed to pond water above low spots in dam crest.*

F AUXILIARY SPILLWAY	**Description**: No auxiliary spillway observed
GOOD ☐ ACCEPTABLE ☐ DEFICIENT ☐ POOR ☐	**Problems Noted**: ☐ None ☐ No Auxiliary Spillway Found ☐ Erosion with Backcutting ☐ Crack with Displacement ☐ Appears to be Structurally Inadequate ☐ Appears too Small ☐ Inadequate Freeboard ☐ Flow Obstructed ☐ Concreted Deteriorated/Undermined ☐ Other
	Comments: *Evaluate need for auxiliary spillway to prevent pond overtopping.*

G MAINTENANCE AND REPAIRS	**Problems Noted**: ☐ None ☐ Access Road Needs Maintenance ☐ Cattle Damage ☐ Spillway Obstruction ☒ Vegetation on Interior Slopes ☐ Trees on Interior and Exterior Slopes and along Toes ☒ Rodent Activity on Interior Slope, Crest, Exterior Slope, and Toes ☐ Deteriorated Concrete –Facing, Outlet, Spillway ☐ Gate and/or Drawdown Need Repair ☐ Other
GOOD ☐ ACCEPTABLE ☐ DEFICIENT ☒ POOR ☐	
	Comments: *Animal burrows remain on the interior slopes. Removal of ash along current waterline at interior toe may be needed to reduce growth of cattails.*

H IMPOUNDMENT AREA	**Problems Noted**: ☐ None ☐ Ponded Water within Ash ☐ Ash blocking spill way ☐ Signs of damage from dredging ☐ Ash deposits in spillway ☐ Other
GOOD ☒	
ACCEPTABLE ☐	**Inflow sources**: ☐ Runoff ☐ Ash Sluicing ☐ Process Water ☐ Other
DEFICIENT ☐	**Release of ponded water could cause overtopping of dam**: Yes ☐ No ☒ N/A ☐
POOR ☐	***Comments***: *Trees within the pond area have been cut.*

DAM ASSESSMENT FORM

I OVERALL CONDITIONS		Comments
SATISFACTORY	☐	***Comments***: *Substantial improvements made since last ATC inspection.*
FAIR	☒	*To obtain "Satisfactory" rating Address all High and Moderate priority action items listed in Findings and Recommendations Table and schedule to address all "Normal" priority action items.*
CONDITIONALLY POOR	☐	
POOR	☐	
UNSATISFACTORY	☐	

Summary of Findings and Recommendations in Attached Table

This visual dam assessment was conducted to assess the general overall condition of the reservoir/ash pond/dam, identify visible deficiencies, and recommend areas for monitoring, additional investigative studies and corrective actions. The assessment is based only on visible features/areas of the dam on the day of inspection; it does not constitute a formal safety inspection nor a review or evaluation from each specialist of an inspection team, such as geologists, civil, geotechnical, structural, or hydraulics engineer. The owner should verify the findings of this report and take corrective actions. This assessment does not relieve the owner/operator from their responsibility to conduct routine inspections, maintenance, repairs, modifications, monitoring, documentation, and/or investigative studies.

Professional Engineer's Signature: [signature] Date: 1-25-11

Reviewed by: David J. Millay Date: 1-25-11
Owner/Owner Representative Signature

PINEVILLE ASH POND PHOTOS
January 18, 2011

Photo #1: Interior slope, east end of south embankment, various animal burrows observed along slope, looking west

Photo #2: Interior slope, west end of south embankment, various animal burrows observed along slope, looking west

PINEVILLE ASH POND PHOTOS
January 18, 2011

Photo #3: Principal Spillway inlet

Photo #4: Interior slope, west embankment, looking north

PINEVILLE ASH POND PHOTOS
January 18, 2011

Photo #5: Interior slope, south embankment, sparse vegetation, southeast corner, looking west

Photo #6: Exterior slope, partially blocked culvert draining ditch below toe at SW corner, looking southeast

PINEVILLE ASH POND PHOTOS
January 18, 2011

Photo #7: Principal spillway outlet, looking northwest

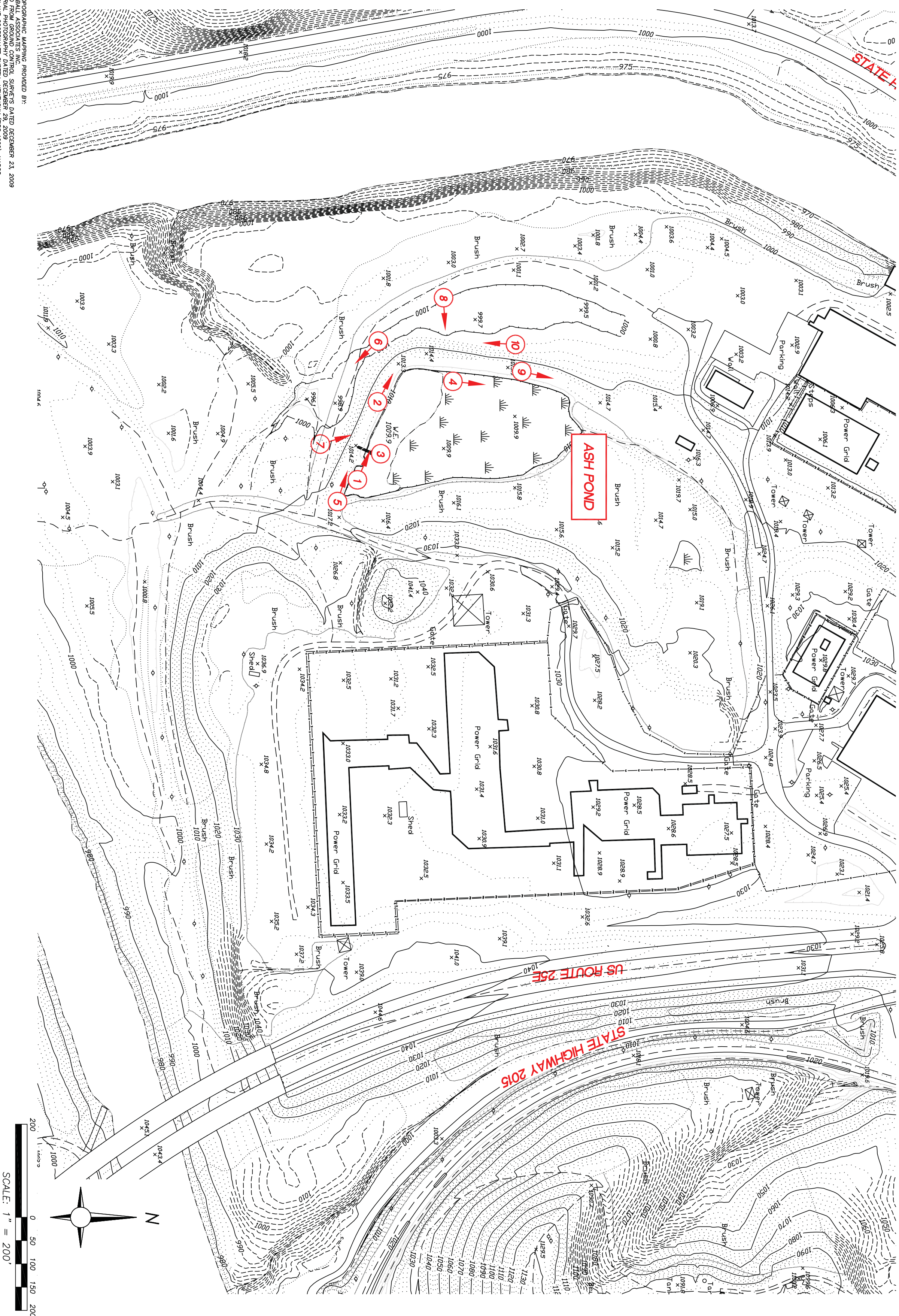
Photo #8: Exterior slope along west embankment, need to repair rutting and re-establish vegetation along slope, looking east

PINEVILLE ASH POND PHOTOS
January 18, 2011

Photo #9: Crest of west embankment, fill low area at upstream side to restore to nominal width, looking north

Photo #10: Exterior slope and toe of west embankment, looking south

2009 TOPOGRAPHIC MAPPING PROVIDED BY:
L.R. KIMBALL ASSOCIATES INC.
CREATED FROM GROUND CONTROL SURVEYS DATED DECEMBER 23, 2009
AND AERIAL PHOTOGRAPHY DATED DECEMBER 29, 2009
STATE PLANE COORDINATE SYSTEM: KENTUCKY (FIPS 1600), NAD83



LG&E - KU 2011 POND INSPECTIONS
KU PINEVILLE STATION - ASH POND
PLAN WITH PHOTOS

Date: 1/11
Scale: AS SHOWN
Figure: C-2

LEGEND:

LOCATION OF PHOTOGRAPH

10 — DIRECTION OF PHOTOGRAPH
PHOTO DESIGNATION

Project Number: 27.11000.1G37	Drn. By: SP
Drawing File: SEE UPPER LEFT	Ckd. By: JE
ATC ASSOCIATES INC.	App'd By: MS
	Ckd. Date: 1/11

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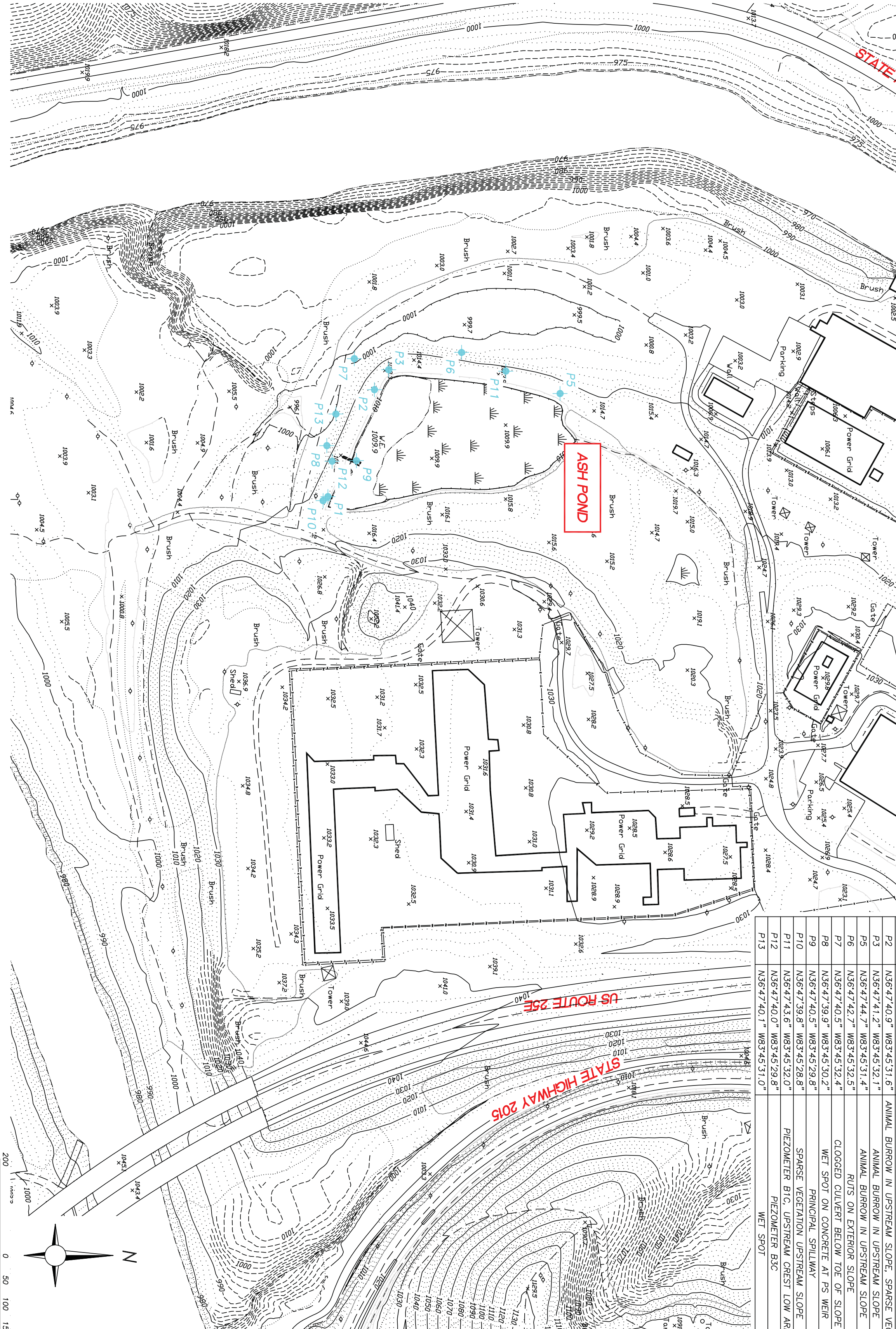

ASH POND – FIELD OBSERVATIONS

GPS PT.	COORDINATES	DESCRIPTION
P1	N36°47'39.9" W83°45'28.9"	ANIMAL BURROW IN UPSTREAM SLOPE, 3 LOCATIONS
P2	N36°47'40.9" W83°45'31.6"	ANIMAL BURROW IN UPSTREAM SLOPE, SPARSE VEGETATION
P3	N36°47'41.2" W83°45'32.1"	ANIMAL BURROW IN UPSTREAM SLOPE
P5	N36°47'44.7" W83°45'31.4"	ANIMAL BURROW IN UPSTREAM SLOPE
P6	N36°47'42.7" W83°45'32.5"	RUTS ON EXTERIOR SLOPE
P7	N36°47'40.5" W83°45'32.4"	CLOGGED CULVERT BELOW TOE OF SLOPE
P8	N36°47'39.9" W83°45'30.2"	WET SPOT ON CONCRETE AT PS WEIR
P9	N36°47'40.5" W83°45'29.8"	PRINCIPAL SPILLWAY
P10	N36°47'39.8" W83°45'28.8"	SPARSE VEGETATION UPSTREAM SLOPE
P11	N36°47'43.6" W83°45'32.0"	PIEZOMETER B1C, UPSTREAM CREST LOW AREA
P12	N36°47'40.0" W83°45'29.8"	PIEZOMETER B3C
P13	N36°47'40.1" W83°45'31.0"	WET SPOT

LG&E - KU 2011 POND INSPECTIONS
KU PINEVILLE STATION - ASH POND
GPS COORDINATES/ SITE OBSERVATIONS

Date:	1/11
Scale:	AS SHOWN
Figure:	C-3
Project Number:	27.11000.1G37
Drawing File:	SEE UPPER LEFT
Drn. By:	SP
Ckd. By:	JE
App'd By:	MS
Ckd. Date:	1/11

ATC ASSOCIATES INC.